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Cement and Engineering News

VOL. XVII.

JANUARY TO DECEMBER
1905

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CEMENT
……AND……
ENGINEERING NEWS

A Group of Members of the National Association of Cement Users.

Taken on the Roof of the Claypool Hotel, Indianapolis, Ind., January 19, 1905.

Cement and Engineering News.
(PUBLISHED MONTHLY.)
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"This world belongs to the energetic."

This paper is a member of the Chicago Trade Press Ass'n.

CHICAGO, JANUARY, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade n all of its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE NATIONAL ASSOCIATION OF CEMENT USERS CONVENTION.

The first National Convention of Cement Users convened at Indianapolis January 17th and after a three-day session adjourned to meet at Milwaukee, Wis., in January, 1906.

The session was remarkable for its enthusiasm and broad intelligence, which clearly indicated that it was composed of men of affairs, who had met to discuss the various applications of Portland cement concrete on broad, practical lines, based upon individual experience. The papers read were as a rule not first class. Several of these papers were positively bad, tending to promote unsound methods, which were corrected by the criticism leveled at them in the discussions by individual members, who were quick to puncture all that was faulty and unsound, thereby keeping the discussions within sound and practical lines at all times.

Questions were repeatedly fired at speakers asking for definite information on the subject under discussion. An answer was always given which, on the whole, was to the point and satisfactory to the questioner. The Convention at times became a veritable experience meeting in which sound ideas were liberated that will do much to insure a greater uniformity of practice in all concrete construction work in the future.

The members attending this convention freely expressed themselves on this point, saying that they had as individuals been more than repaid for the expense incurred in attending the convention.

Every concrete worker should attend these conventions and thereby profit by the vast fund of useful information which is dispensed on every subject which comes up in his daily practice during the active season of construction. It will be money in his pocket so to do. Come to the next Milwaukee convention and you will not regret it. It will place you in touch with the latest wrinkles and practice in the working and handling of concrete to obtain good and uniformly sound work.

The convention was a success throughout, especially in the large number of concrete workers and cement machinery men in attendance, something over 590 men signing the roll of membership. Great credit is due to the officials of "Municipal Engineering" for conceiving and organizing the convention in the first instance. The organization as it exists to-day stands upon broad, independent lines controlled by no clique or clan, but represents the honest expression of a clear majority of the members assembled at Indianapolis, with a mission to infuse life and sound practice into the concrete worker's art. A list of officers elected will be found on another page.

THE NORTHWESTERN CONCRETE PRODUCTS CONVENTION.

The above named convention held at Minneapolis January 24, 25, 26 and 27, was largely attended, over 360 persons names appearing on the roll of membership. O. W. Miracle was chosen president; F. H. Chapin, secretary; John M. Hazen, treasurer. Several papers were read. Particular pains were observed to impress the names of newspapers which appeared on the roster of the convention. When the roster was printed, some of the exhibitors complained of excessive charges for space, compared with the charges exacted for the same space by the Lumberman's exhibit which succeeded the Concrete Products exhibit, which was three-fifths less than that exacted by the Concrete Products convention. In calling attention to this discrimination we simply voice the sentiments of the numerous exhibitors. The convention was a success from every point of view.

Louisiana Lime & Cement Company, New Orleans, La. Capital stock, $400,000. Incorporators, Wm. J. Kelly, president; Wm. A. Lombard, Vice-president; Matthew Warriner, sec'y. The plant of the Louisiana Lime Company will be secured and a Portland cement plant, having a daily capacity of 1,000 barrels, will be erected.

THE RAILWAY CONTRACTORS' HANDBOOK.

The Railway Contractors' Hand-Book, by John M. Hazen, C. E., 147 pages, 4 1-2x5 1-2 inches, published by the author, at Minneapolis, Minn. Price $2.00. Contains 102 tables of level cuttings or banks, for single or double track and for second track work, from 10 to 32 feet wide, and from a vertical to 3 to 1 slope, to a height or depth of 35 9-10 feet, by tenths of a foot. With daily tables of wages from $1.25 per day to $5.00 per day, each day's wages being divided into fractions of hours, so that the num-

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	NOVEMBER				ELEVEN MONTHS ENDING NOVEM			
	1903		1904		1903		1904	
	Quantity in lbs.	Value in Dollars.	Quantity in lbs.	Value in Dollars.	Quantity in lbs.	Value in Dollars.	Quantity in lbs.	Value in Dollars.
United Kingdom.	8,554,800	28,005	6,000	76	58,797,537	190,444	6,411,230	22,262
Belgium..........	21,384,616	65,600	25,283,738	85,689	292,363,024	855,435	154,662,117	484,380
France............	297,600	1,277	811,900	3,147	4,718,787	19,868	12,119,592	41,516
Germany..........	48,736,487	156,961	15,047,696	41,328	532,302,572	1,793,208	183,927,773	613,330
All Other Europe.	387,241	919	....	....	10,966,107	30,575	3,010,635	10,265
British North Am.	78,400	384	25	1	1,768,274	8,516	226,475	1,180
Other Countries..	4,000	18	3,900	36	3,705,880	15,561	2,836,512	9,899
TOTAL..........	79,443,144	253,164	41,153,259	130,277	904,622,187	2,943,607	363,194,334	1,182,832
Domestic Exports of Cement, bbls..	30,676	46,727	139,013	193,116	268,290	406,262	670,774	972,264

There were 13,450,424 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses on Nov., 1903, valued at $49,533 against 14,181,061 lbs., valued at $43,887 on Nov., 1904.

Imports of asphaltum or bitumen for Nov., 1903, were 12,429 tons, valued at $36,380; Nov., 1904, 8,560 tons, valued at $31,467. For eleven months ending Nov., 1903, 154,213 tons, valued at $467,213; for eleven months ending Nov., 1904 106,999 tons, valued at $448,020.

ber of days and hours each man has worked and the exact amount due for such time can be determined. Numerous other tables are given, such as the contents of tanks, weight of materials, cost of masonry, cubic yards of various shapes, and other useful information useful to railroad contractors.

REINFORCED CONCRETE COFFIN.

M. Michel Sarda of Perpignan, Dept. of Pyreneese, Orientals, France, has invented a reinforced concrete burial casket, which is capable of being hermetically sealed so as to permit of transporting the remains on railway.

Fig 1

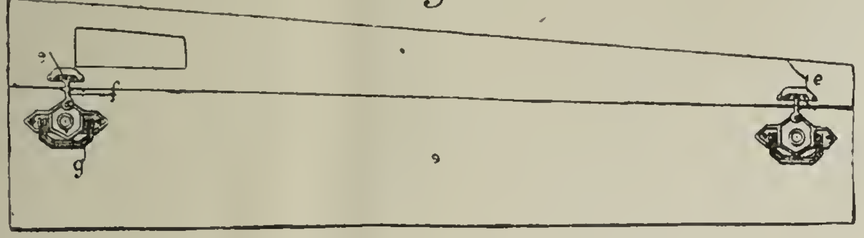

Fig 2

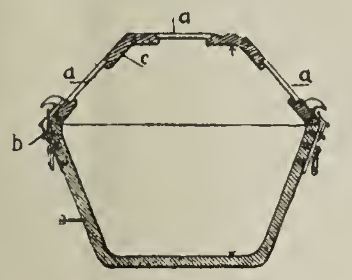

Fig.3

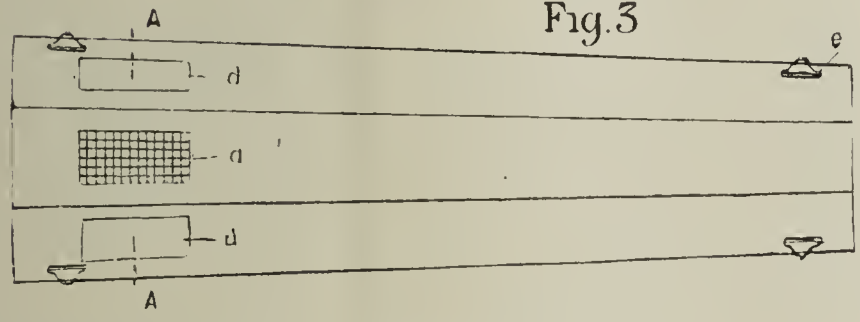

Fig 4

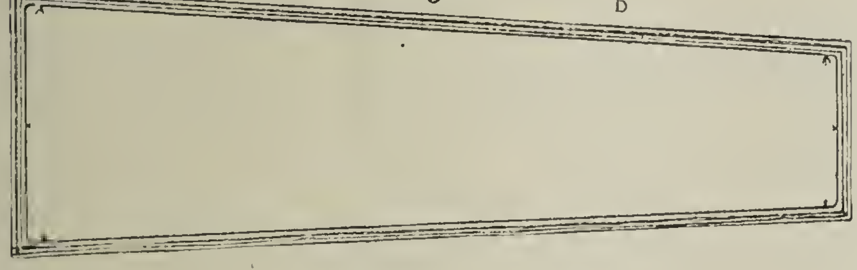

Fig. 1 is a side view of the casket which consists of a top and lower section. "G" showes the handles. Between each handle there is an electric alarm bell, which is designed to give an alarm should the body show indications of life.

Fig. 2 shows a cross section. "b" is a hinge that fastens the upper and lower sections of the casket together. "A," "A," "A," are openings with glass plates inserted.

Fig. 3 is a top view. A grating of metal covers the top of the central glass plate.

Fig. 4 shows the metal rods used in the reinforcing of the concrete. The lid and lower portion of the casket when closed for burial are joined by a rich cement mortar. Our illustrations are from *Le Ciment.*

NOTES.

Fifteen hotels in New York City completed and under way will cost $50,000,000.

H. von Schon, C. E., formerly of Sault Ste. Marie, Mich., has removed to 603 Wayne County Savings Bank Bldg., Detroit, Mich.

The General Fireproofing Co., 315 Old Colony Bldg., Chicago, has issued a handsome pamphlet, 9x12 in., beautifully illustrated, covering reinforced concrete construction for floors, roofs, sewers, reservoirs, conduits, piers, foundations, also herringbone and expanded metal lath for ceilings, cornices, partitions, etc. The numerous illustrations show various large office buildings, apartment houses, hotel structures, factory and power plants, warehouses, and other structures in which expanded metal has been used for floors, partitions, and roofs, with valuable data on reinforced concrete fireproofing. Interested parties can obtain copies by applying to the above address.

The Allis-Chalmers company opened new sales offices in Philadelphia on January 1st in the Land Title Bldg. The offices heretofore maintained by the Electrical Department of the company, the Bullock Electric Manufacturing Company, in the North American Building, have been removed also to the Land Title Building where they have been consolidated with those of the parent company. The new offices are under the charge of Mr. W. A. Wood, who will look after each of the interests of the company. These interests include the Power Department, the Electrical Department, Pumping Engine Department, Hydraulic Department, Saw Mill Machinery Department, Flour Mill Machinery Department, and others which produce rock crushing machinery, cement making machinery, wood preserving machines and plants, mine hoists and machinery of all other kinds for mining and recovering gold, silver, copper and other metals.

The Widell-Finley Company, engineers and contractors, has been incorporated for carrying on a general engineering and contracting business and succeeds to the contracting business of G. Widell, of Mankato, Minnesota. They will make a specialty of all classes of foundation and substructure work, masonry and concrete structures, and the erection of steel and wooden bridges, and are well equipped to undertake any construction work of this nature.

Mr. G. Widell has been long and favorably known as a contractor for high-class masonry and concrete work.

Mr. W. H. Finley is a Member of the American Society of Civil Engineers and a member of the Western Society of Engineers, and has been connected with the engineering department of the Chicago and North-Western Railway for the past thirteen years, as engineer of bridges during eight years of that time and as principal assistant engineer for the past five years.

Mr. W. A. Hazard is a member of the Western Society of Engineers. He has had a long experience in construction work, having been connected with the engineering department of the Chicago and North-Western Railway for two years as assistant engineer in charge of construction, and for the past six years as engineer and superintendent of construction for Mr. G. Widell.

The company has offices at 655-656 Monadnock Block, Chicago, and in Mankato, Minnesota. Mr. Finley and Mr. Hazard are in charge of the Chicago office.

MATERIALS WHICH RETARD THE SETTING OF PORTLAND CEMENT.

By R. C. Carpenter.

Portland cement, when mixed with water, has two properties pertaining to the hardening process which are essentially similar in many respects but differ in quality and characteristics to such an extent that they have received different names. The one property, that marks the preliminary process during which the mortar becomes pasty and brittle, is termed the "setting," the other, which is slow, long continued and permanent, the "hardening." In accordance with investigations of Le Chatelier, the "setting" is due to the formation of saturated solution of alumina compounds as aluminate of lime and similar compounds from which crystals are deposited with great rapidity in the case of rapid setting cements and at a less rapid rate with those which set slowly. The hardening process which takes place later is largely due to the formation of crystals of silica compounds as trisilicate of lime which are interlaced with cyrstals of other compositions.

In many instances the setting, which is the initial process of hardening, takes place so rapidly as to present practical difficulties in the proper gauging and use of the cement. To overcome these difficulties it has been customary for many years in the manufacture of Portland cement, to mix with the cement some material which would retard the formation of the crystals of aluminate of lime and similar compounds and thus regulate the time of setting.

For this purpose gypsum (sulphate of lime, CaSO4) has been principally used. The effect of adding gypsum is only temporary provided the cement is exposed to the air, and for that reason other materials have been sought for. The present article gives a brief description of some experiments made in the Mechanical Laboratory in 1904 by Walter H. Kinskern and William L. Gass, for the purpose of determining the regulating power on the cement of gypsum and chloride of calcium ($CaCl_2$).

For the purposes of the experiment, one of the large Portland cement works supplied us with clinker which had not been treated and which in its normal condition made a remarkably quick setting cement. This clinker was ground in a pebble mill owned by the laboratory under conditions which permitted the addition of the various materials to be tested.

Influence on Time of Setting of Cement Mixed With Sulphate of Lime (Gypsum.)

The following shows in tabular form the results of adding different amounts of gypsum, the gypsum being proportioned by weight, as indicated in the first column of the table. In these experiments the time of initial set is taken in every case as the time when a pat of the cement made by mixing with the percentage of water shown, would bear a rod with diameter of 1-12- in. carrying a weight of 1-4 lb. The time of final set is that time which has elapsed since mixing when the pat will bear a rod 1-24 in. in diameter carrying a weight of 1 lb. This method of determining the set, although commonly used, depends to some little extent upon the judgment of the operator and as would naturally be expected gives results which are somewhat irregular although sufficiently accurate for purposes of comparison.

The results of the trials referred to with gypsum show that 1 1-2 per cent produces the maximum effect in retarding the set, and that for the special samples tested no beneficial results were obtained by the use of a large amount.

The following table shows the retardation of the set due to using different quantities of gypsum:

Per Cent CaSO4.	Per Cent Water.	Initial Set.	Final Set.
0.0	29.8	2.0 min	52 min.
0.5	27.6	6	87
1.5	22.1	80	157
2.0	22.1	24	114
2.5	23.7	29	79
3.0	22.1	30	69
3.5	22.1	27	72
4.0	24.2	28	45
4.5	25.4	22	40
5.0	25.4	27	59
5.5	25.4	20	78
6.0	24.2	19	37
6.5	23.7	22	40
7.0	25.4	18	59

Although the experiments above show that a maximum retarding effect is produced by the gypsum when less than two per cent was ground with the clinker it is quite certain from previous experiments that with Portland cement of a somewhat different composition or manufacture that the proportion of gypsum for producing the maximum effect might have varied from the above.

Thus E. Candlot, in his work "Ciments et chaux hydrauliques" gives the results of adding different quantities of gypsum to three specimens of cement, the results showing in each case an increase in retardation of set up to 2 per cent. and in one instance up to 4 per cent. His experiments were as follows:

Quantity of Gypsum added	Time of Setting in Fresh Water.											
	1				2				3			
	Initial		Final		Initial		Final		Initial		Final	
per cent	h	m	h	m	h	m	h	m	h	m	h	m
.0	0	7	0	22	0	7	0	15	0	2	0	5
.5	0	50	2	43	4	10	0	17	0	2	0	5
1.00	2	40	4	50	3	50	5		1	30	2	35
1.5	2	57	5	17	3	50	5		3	20	5	15
2.0	3		5	20	4	20	6	45	4		7	
3.0	3		6	40	3	45	7		5		7	
4.0	3	30	7		5		7		5		7	

In the above table it is noted that the extremely rapid setting cement, No. 3, had a maximum retardation when 2.0 per cent of gypsum was added, when a larger amount was added there was no effect on the time of setting. With the slowest setting specimen, the retardation increased as the amount of gypsum was increased to 4 per cent, although the increase was slight after 3 per cent had been added. The experiments show no decrease in time of the final set due to an increase in the amount of gypsum up to 4 per cent.

As showing the temporary effect of gypsum in regulating the set, the following experiments are quoted from Candlot, when Portland cement is mixed with fresh water:

The above tests were made when the cement was exposed to the action of the air. It is noted that in two cases a long time test showed a return of the retarding action of the gypsum on the cement, although it is not certain that this might not have been due to some other cause.

Candlot kept Portland cement mixed with 2 per cent of gypsum in a very close bin with the following results:

	Time of Set. Initial h	Time of Set. Initial m	Time of Set. Final h	Time of Set. Final m
Trial made the day of mixture........	3	0	6	25
Trial made after one month..........	2	50	5	
Trial made after two months.......	1	30	7	
Trial made after five months........	0	10	0	18

The addition of small quantities of sulphate of lime increases the strength for all cases except when the cement is immersed in sea water and the proportion of sulphate is greater than 2 per cent; for this last case the briquettes soon show traces of alteration and in time completely disintegrate.

The experiments quoted are conclusive in showing that there is little or no advantage gained in adding more sulphate of lime than 2 per cent, and I believe that it would not be an unreasonable requirement in specifications to call for such a limitation.

Experiments made by Candlot and verified in the Mechanical Laboratory of Sibley College indicate that an addition of 2 to 4 per cent of slaked lime or hydrate of lime added to a cement containing a small percentage of gypsum, which has through the influence of time, lost its effect in retarding the cement, will restore the slow setting properties.

Tests Made by Candlot.

	Time of Set Initial h	Time of Set Initial m	Time of Set Final h	Time of Set Final m
Cement containing 2 per cent of gypsum	0	20	2	30
Same cement to which has been added 2 per cent of lime	6	0	10	0
Cement containing 1 per cent of gypsum	0	10	0	20
Same cement with 2 per cent of lime added	1	0	8	0
Test made in Sibley College Laboratory of sample containing 2 per cent of Sulphate..	0	12	0	15
Same cement with 5 per cent of lime hydrate added	2	0	5	0

The additional lime does not detract from the tensile strength, as in the case of the last named cement its initial strength, neat, was as follows:

24 hours, 360 lbs.
1 week, 757 lbs.
1 month, 871 lbs.

The addition of hydrate of lime without the addition of the sulphate of lime, seems to have little or no effect on the time of setting, as shown by experiments made by Kniskern and Gass.

Influence of Chloride of Calcium in the Setting and Hardening of Portland Cement Mortars.

The investigation of E. Candlot as recorded in his work on Ciments et Chaux Hydrauliques, shows that when Portland cement is gauged with a feeble solution of chloride of calcium, it has the effect of greatly retarding the time of setting, but when the Portland cement is gauged with a concentrated solution of chloride of calcium, as for instance 100 to 400 grammes per litre, it acts in a contrary manner and tends to increase the rapidity of setting. Candlot gives the following table as showing the results of his experiments:

Solution of $CaCl_2$ Gr. per Litre.	Time of Setting of Neat Cement. 1 h	1 m	2 h	2 m	3 h	3 m	4 h	4 m
2	0	5	1	5	8		1	34
5	0	8	10		12		2	
10	8	18	10		14		5	50
20	1		12		10	30	8	
40	4	35	8		6	30	8	35
60	3	20	6		4		6	
100	0	3	0	20	0	30	3	30
200	0	3	0	9	0	5	0	25
300	0	2	0	8	0	3	0	5

Candlot explains the action of the chloride of calcium by stating that a feeble solution of chloride of calcium tends to retard the solution of these alumina salts which on crystalizing cause the material to set. The feeble solutions have no appreciable influence on cements which do not contain alumina. In case the concentrated solution of chloride of calcium is used for gauging, the aluminate of lime is attacked very energetically, which thus causes a very rapid set, as indicated by the experiments given above.

Candlot also mentions that a feeble solution of chloride of calcium acts very rapidly in hydrating or slaking lime and quotes an experiment showing that a cement containing an excess of lime, gauged with pure water swelled and disintegrated because of the tardy expansion of the free lime, while the same cement gauged with a solution of chloride of calcium containing 30 to 60 grammes per litre gave no evidence of swelling because the free lime was slaked completely and perfectly before the beginning of the initial set. The following experiment from Candlot shows the action of chloride of calcium in accelerating the slaking of lime. This action is shown in the experiment by the rapid rise of temperature caused by the slaking action when the lime is mixed with the solution of chloride of calcium:

Time	Temperature, Degree C. Distilled water	30 grms. $CaCl_2$ per litre	60 grms. $CaCl_2$ per litre
Initial	18	18	18
5 min.	19	19	19
10 min.	20	21	24
15 min.	25	35	90
20 min.	25	90	98
25 min.	25	98	99
30 min.	20	90	95

The lime was completely slaked or hydrated in 30 minutes when gauged with either solution of chloride of calcium, but required about 48 hours before it was completely slaked when the distilled water was used.

Candlot has also pointed out that a concentrated solution of chloride of calcium tends to harden Portland cement very rapidly and causes the tensile strength to reach a maximum quickly. The cement made in that way at the end of the year being, however, perfectly good and sound.

Messrs. Kniskern and Gass in the Sibley Laboratory ground different percentages of chloride of calcium with cement clinker and afterwards made pats using in each case simply enough water to give the material its normal consistency for this purpose. Their results show that the chloride of calcium had great effect in retarding the time of setting and exerted the greatest effect when about one-half of one per cent by weight of the chloride of calcium was employed. On account of the water required, 1 per cent of the cloride of calcium would correspond approximately to gauging with a solution of 30 grammes per litre in the previous experiments quoted.

$CaCl_2$ Ground Dry With the Clinker.

Per cent of $CaCl_2$	Per cent of water	Initial set	Final set
0.0	29.8	2.0 m.	52 m.
0.5	34.1	115	274
1.0	29.8	160	272
1.5	26.4	167	234
2.0	25.4	127	212
2.5	26.4	103	180
3.0	26.4	45	182
3.5	26.4	97	185
4.5	28.6	63	150
5.0	29.8	73	160
5.5	29.8	76	84
6.0	29.8	68	145

The experiments quoted indicate that chloride of calcium added in small percentages either to the ground clinker as a powder or mixed with the water for gauging, has an important effect in extending the time of setting of Portland cement, and so far as the investigations which are accessible show, it does not have any detrimental effect on the permanent strength and hardness.

Chloride of calcium is a deliquescent material which rapidly absorbs moisture and it is possible that if ground dry with the Portland cement clinker even to the amount of 1-2 per cent, it would cause the material to gather dampness and thus have a bad effect. The chloride of calcium solution can be added readily by adding it to the water used in gauging since it dissolves with extreme rapidity. The experiments indicate that the set can be controlled by using less than 1-2 per cent, which would be something less than 2 pounds to the barrel of Portland cement. Investigations are still necessary for determining whether the effect of chloride of calcium added to the cement before grinding is permanent in its effects and whether if ground with the cement clinker it would exert any detrimental effect, and such investigations will be conducted in the Sibley College Laboratory at the first opportunity.

SOMETHING ABOUT SULPHUR.

By Edmund Johnson, Yankton, S. D.

One of the greatest bugbears to the cement chemist is sulphur. The writer has had some experience with this element which may perhaps be of interest to others having it to contend with.

When first going into a cement laboratory he supposed it possible to compute from the raw materials the per cent of SO_3 that would be found in the clinker. Practical results soon showed this idea to be wrong.

In one mill the materials we handled were shale and limestone. They were mixed in proportions of about 320 pounds of shale to 1000 pounds of limestone. The amount of sulphur in the shale was equivalent to about 7 per cent. SO_3. It existed partly as iron pyrites and partly as calcium sulphate. It will be seen that if none of this were volatilized it would exceed 2 1-2 per cent. in the clinker. For a period of over four months a daily analysis of the clinker was made from samples taken every half hour from the kilns.

The average of all the sulphur determinations from these analyses was 1.15 per cent. Only two days did it exceed 2 per cent; the highest being 2.22 per cent. and the lowest 0.25 per cent. Frequent determinations of sulphur as sulphide gave results varying from 0.01 per cent. to 0.14 per cent with an average of 0.062 per cent.

Since then laboratory experiments have been made with other materials the clay of which contained as high as 12 per cent SO_3. For these experiments a small rotary kiln was constructed 2 1-2 feet long and 3 inches internal diameter, and heated with a Hoskin's blowpipe. The time during which the material is subjected to the heat is regulated by the slant and speed of revolution so as to approach as nearly as possible the actual conditions in the large rotary. Different mixtures were made, the clay being one-fifth to one-fourth of the whole. When the clinker was limed to 65 per cent. analysis did not show a trace of sulphur. When limed to 63 per cent. the clinker showed 0.91 per cent. SO_3. A very low-burning mixture (56.50 per cent. CaO) with raw materials ground extremely fine gave 1.36 per cent. SO_3.

During these experiments the writer conceived the idea that silicic acid being a colloid and unionizable in water solution, might there be very weak in proportion to the sulphur acids; yet under the semi-molten condition in the rotary kiln its acid properties might be strong enough to displace sulphur from its compounds. To test this theory 1,000 grams of gypsum were ground and mixed with 184 grams of clay and burned in the small rotary kiln. The gypsum analyzed as follows:

SO_2, 2.30 per cent.
R_2O_3, 0.75 per cent.
CaO, 32.18 per cent.
SO_3, 46.89 per cent.

The clay also contained 11 per cent SO_3.

During the burning of this mixture the fumes of sulphuric acid became so strong in the laboratory that it was necessary to throw open the doors and windows. The clinker resembled first-class Portland cement clinker and when ground the resulting product proved to be a true Portland cement giving the following analysis:

SO_2, 22.20 per cent.
Al_2O_3, 7.64 per cent.
Fe_2O_3, 4,39 per cent.
CaO, 64.38 per cent.
SO_3, 1.83 per cent.

Pats made of the cement took their initial set in 3 hours and 20 minutes, and final set in 10 hours. They hardened well and passed a 4 hour boiling test O. K. in every particular.

The result of this experiment seems to indicate that under ideal conditions the sulphur in a cement mixture may be completely expelled during the burning.

The writer's experience in the actual manufacture of Portland cement on a commercial scale has been that the more nearly the ideal conditions are approached, the less trouble there will be from sulphur, even though it be present in the raw materials in percentages usually considered sufficient to warrant their condemnation.

The writer would like to hear from others who have had similar or contrary experiences.

CONTRIBUTION FROM THE COMMITTEE ON UNIFORMITY IN TECHNICAL ANALYSIS, I.

The object of the present communication is to offer to American chemists a sketch of the reasons for the existence of the Committee on Uniformity in Technical Analysis and a statement of the policy by which it expects to be guided in seeking to remedy the present very unsatisfactory condition of analytical chemistry in at least some lines of work.

The causes to which the committee owes its existence can best be made clear by a review of the work done by several committees in the lines of cement, copper slag and zinc ore analysis, with the co-operation of a large number of chemists throughout the country.

Review of Past Work.

In 1901, Mr. Clifford Richardson presented before the New York Section of the Society of Chemical Industry an address in which he showed the lamentable lack of agreement among different chemists in analyzing Portland cement. The result of his recommendations was the appointment of a committee of the Section to consider the subject of technical analysis, the first line of work taken up practically being that of the analysis of Portland cement and raw cement mixtures, by a subcommittee consisting of Messrs. Richardson, S. B. Newberry and H. A. Schaffer. The results of their labors have been made public in the Journal of the Society of Chemical Industry, 21, 12, and this Journal, 25, 1180. Discussions of and criticisms upon these reports have appeared at one time and another notably in the *Journal of the Society of Chemical Industry,* 21, 830 and 1216, and this Journal, 26, 995; also *Cement and Engineering News,* 16, 37. Opinions differ as to the merits of the proposed analytical procedures but the general effect of the subcommittee's work has been to greatly stimulate interest in the matter of cement analysis by the bad showing made, and to create a desire for greater uniformity in results. Owing to the wide publicity given to these reports, they will not be here discussed, though the extreme results rendered by the co-operating analysts will be reproduced farther on.

Inspired by his own experiments, Mr. Thorn Smith, of Isabella, Tennessee, had undertaken, independently of Mr. Richardson's committee and without knowledge of its operations to ascertain the actual state of analysis with respect to copper slags, by enlisting the co-operation of a large number of chemists in the analysis of a sample prepared and distributed by himself. The results of this work were later placed in the hands of Mr. Richardson's general committee, and, as in the case of the cement analyses, a critical report was rendered at their request by Dr. Hillebrand, of the United States Geological Survey. This report has never been published, though copies were placed in the hands of the chemists who had furnished analyses. The original analytical returns with comments by Mr. Thorn Smith, based on Dr. Hillebrand's report, appeared in the *Engineering and Mining Journal,* 75, 295, to which reference should be made for details. Certain data from this report will follow those relating to cements farther on.

Later, a sub-committee on zinc ore analysis was appointed, consisting of Mr. W. George Waring, of Webb City, Mo., and Mr. George C. Stone, of New York City. They distributed three samples of ore differing widely in character, and received more or less complete returns from forty-two chemists, on the basis of which the sub-committee has prepared a valuable report, which will receive attention in its proper place.

Meanwhile, for reasons which are not pertinent to this report, the central committee of the New York Section of the Society of Chemical Indusry was dissolved. and the laudable aims which it sought to attain might have failed altogether of further pursuit had not the Council of the American Chemical Society directed the appointment of the present committee for the purpose of continuing the work begun by its predecessor in the other Society. The report on zinc ore analysis, above alluded to, is now in the hands of our committee, and Messrs. Waring and Stone will be continued as one of its sub-committees for the purpose of accumulating further data of an important character upon which to report at a later date.

In the first three of the following tables are presented briefly, for convenient reference, the extreme results reported by the chemists who co-operated with the former sub-committee on cement analysis and with Mr. Thorn Smith. They are followed by a detailed table of results reported by the zinc ore sub-committee and an abstract of certain features of that report. Greater space is devoted to this than to the other reports for the reason that it has not appeared in print and it is desirable that those who are engaged in the work of analysis be put in possession of the results of their fellows without further delay.

TABLE I.—EXTREME RESULTS ON (*a*) ORIGINAL CEMENT RAW-MIXTURE, (*b*) ORIGINAL FINISHED CEMENT

		SiO_2.	Al_2O_3. Fe_2O_3.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	SO_3.	Ign.
(*a*)	High....	15.75	8.50	6.64	2.73	41.92	2.14	....	....
	Low	12.78	7.08	5.27	1.26	39.53	1.10	....	....
(*b*)	High....	21.56	11.36	8.20	3.76	64.30	3.15	1.71	3.20
	Low	19.18	9.32	6.26	2.30	62.01	2.52	1.30	1.04

TABLE II.—EXTREME RESULTS ON SECOND SAMPLE OF (*a*) RAW MIXTURE, (*b*) CEMENT.

		SiO_2.	Al_2O_3, Fe_2O_3.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	SO_3.	Ign.
(*a*)	High....	15.54	7.07	4.13	2.66	42.27	1.50	1.75	39.68
	Low	12.10	4.20	2.36	1.14	40.21	0.62	1.42	35.15
(*b*)	High....	22.86	9.68	6.46	4.30	64.43	2.82	2.26	4.50
	Low	20.50	8.36	4.88	2.26	62.14	0.95	1.38	0.98

It may be said with regard to the results of Table II that is was intended they should be arrived at according to a method suggested by the sub-committee on cement analysis, but they are in no way to be taken as a fair test of that method, for the reason that its provisions were adhered to by so few of the analysts. Nevertheless, notwithstanding the wide variations between extremes, a critical review of all the data showed that marked progress had been made in certain directions.

TABLE III.—EXTREMES ON COPPER SLAG BY NINETEEN ANALYSTS.

	SiO_2.	Fe.	Al_2O_3.	CaO.	MgO.	Zn.	Mn.	Cu.	S.
High	35.15	32.20	7.16	13.53	3.21	4.25	1.53	0.46	1.98
Low	31.27	30.33	3.24	10.73	1.20	1.87	0.11	0.20	1.45

It may be added for these figures that they do not tell the whole truth. Only those have been included which it seemed worth while to consider in a general discussion of the causes of variation. Certain values, reported by one or two analysts, were omitted as not entitled to consideration, though included in the originally published tables.

DATA FROM UNPUBLISHED REPORT OF SUB-COMMITTEE ON ZINC ORE ANALYSIS.

TABLE IV.—ASSAYS OF ZINC ORES BY FORTY-TWO CHEMISTS.

	Sample A.			Sample B.[1]			Sample C.[1]		
	Zn.	Method.	Fe.	Zn.	Method.	Fe.	Zn.	Method	Fe.
1	59.06	3	2.28	17.96	3	20.63	31.47	3	11.06
2	58.64	7	2.38	17.42	7	19.99	31.97	7	10.74
	58.90	3	...	17.59	3	....	32.08	3	....
	59.73	3	...	18.21	3	....	32.50	3	....
3	57.10	3	2.96	17.70	3	20.52	28.90	3	10.40
4	57.65	3	2.61	18.81	3	20.76	32.81	3	....
5	57.83	3	2.67	18.10	3	20.92	32.13	3	10.92
6	57.52	4	2.86	38.15	4	18.04	38.77	4	11.02
7	59.13	4	...	39.22	4	....	37.05	4	....
8	58.37	4	2.30	18.90	6	18.80	31.30	5	10.60
9	58.47	4	2.80	18.65	6	19.50	31.39	5	10.90
10	57.90	1	2.10	13 00	1	19.90	30.90	1	15.00
11	58.40	4	2.40	18.40	6	20.60	31.80	5	11.00
12	57.80	7	3.26	17.80	7	21.42	31.00	7	12.51
	57.80	7	3.26	17 95	7	21 80	31.10	7	12.90
13	58.30	4	...	12.85	1	....	31.30	1	....
	58.35	4	...	16.90	6	....	31.80	5	....
	58.35	4	...	16.90	6	...	31.90	5	....
	....		...	17.80	8	....	32.80	5	....
	....		...	17.90	6	....	33.00	5	....
	....		...	18.20	7	....	33.20	5	....
14	58.30	4	...	17.90	6	....	33.00	5	....
15	58.30	1	...	12.87	1	....	31.60	1	....
	....		...	17.80	6	....	....		....
16	58.30	4	2.20	17.30	6	19.64	31.60	5	10.04
17	58.65	2	2.42	17.20	2	21.20	30.85	2	10.44
18	....		...	12.98	1	....	30.54	1	....
19	58.41	1	2.42	18.74	2	20.34	31.62	1	10.80
20	58.78	4	2.72	19.42	6	21.13	31.65	5	11.08
21	58.42	1	...	15.21		21.05	30.83	1	....
	....		...	16.23	7	21.92	....		....
22	58.35	4	2.64	16.94	6	20.40	31.25	5	10.29
23	56.03		2.30	15.60		19.55	30.28		10.60
24	59.79	4	3.23	17.60	6	20.75	30.77	5	13.03
	....		...	32.14	4	....	....		....
25	57.73	1	2.70	19.57	2	20.59	33.83	1	11.33
26	38.23	1	2.51	17.53	2	20.58	31.08	1	10.80
27	57.30	1	...	12.50	1	....	30.80	1	....
28	58.00	1	...	....		....	....		....
	58.00	1	...	....		....	....		....
29	58.50	4	2.50	13.00	1	20.80	32.40	5	8.40
30	50.80	1	2.50	12.53	1	20.05	31.40	1	11.45
	....		...	17.83	8	....	....		....
	....		...	18.11	6	....	....		....
31	57.73	7	...	18.24	7	....	32.41	7	....
	58.37	1	...	18.33	7	....	32.51	7	....
32	58.90	1	2.30	12.60	1	20.20	30.20	1	11.30
33	58.10	8	2.38	12.20	1	20.35	30.90	5	10.77
	58.25	4	...	12.73	1	....	31.28	8	....
	58.40	8	...	13.74	1	....	31.38	7	....
	58.40	4	...	17.53	2	....	....		....
	58.59	8	...	17.87	2	....	31.45	8	....
	....		...	....		....	31.51	8	....
	....		...	17.89	7	....	31.60	5	....
	....		...	17.95	6	....	....		....
	....		...	17.98	8	....	....		....
	....		...	18.09	8	....	....		....
	....		...	18.10	2	....	....		....
	....		...	18.15	8	....	....		....
	....		...	18.15	2	....	....		....
	....		...	18.24	7	....	....		....
	....		...	35.12	4	....	....		....
34	57.85	4	2.40	....		....	31.10	1	8.60
35	58.10	4	2.30	22.76	6	20.60	31.90	5	8.80
36	55.97	3	...	17.85	3	....	38.86	3	....
37	57.58	1	...	14.35	1	....	30.96	1	....
	58.47	7	...	18.21	7	....	31.53	7	....
38	58.03	4	2.77	17.99	7	20.14	31.09	7	11.47
39	59.72	3	2.38	18.22	3	19.89	32.54	3	10.74
40	57.50	4	2.40	23.30	6	20.29	30.90	5	10.71
41	57.85	3	...	....		....	....		....
42	59.12	1	...	14.73	1	....	31.16	1	....
High	59.73		3.26	39.22		21.92	38.86		15.00
Low	56.03		2.10	12.20		18.04	28.90		8.40

[1] A. Blende from Joplin, Mo.
B. Oxidized ore from New Jersey, containing franklinite, willemite and zinc spinels.
C. Impure blende from Colorado.

Mr. Waring analyzed the ores and his results for the important constituents follow, those for zinc being the average by three methods, those for cadmium the mean of duplicate determinations.

	A	B	C
Zn	58.25	18.16	31 45
Fe	2 38	20.36	10.77
Mn	....	9.37	....
Cd	0 34	....	0.016
Cu	0 08	....	6.92
Pb	1 52	....	13.80

Of the forty-two chemists whose returns are listed above, "twenty-three are, or were, in zinc works, three in other works where zinc is frequently determined, eleven were commercial chemists, most of whom make a specialty of zinc, and five were professors or instructors in colleges. The samples were sent to a number of other college men, all of whom either declined to analyze them or failed to report after repeated requests to do so."

After a brief discussion of the figures for iron, the authors say: "It is certainly not to the credit of the analysts that such enormous differences should exist in as simple a determination as iron," a conclusion which is fully in accord with those expressed by Dr. Hillebrand in his report on the cement and copper slag analyses.

Naturally, the greater part of the report is devoted to the zinc figures. The methods used for determining zinc were numerous and are numbered in the table.

1.—Low's method (Proc. Colo. Sci. Soc., 4, 179; this Journal, 22 198).

2.—Hinman's modification of 1, using hydrochloric acid as the solvent (School of Mines Quart., 14, 40; Furman's "Assaying," 4th ed., p. 207).

3.—Wintersteen's method, unpublished, but practically the same as Voigt's (Ztschr. angew. Chem. 1889, p. 307), using citric acid for tartaric acid.

4.—The Joplin method, which is practically the Fahlberg method (Ztschr. anal. Chem., 13, 379, and Waring in this Journal, 26, 20-22).

5.—This is 4, modified so as to remove copper by lead, or lead, copper and cadmium by aluminum or hydrogen sulphide (this Journal, 26, 23-24).

6.—Methods in which the iron is removed by ammonia, barium carbonate or as basic acetate, and the manganese by an oxidizing agent. The zinc usually titrated, but in some cases weighed. Copper in all cases removed (this Journal, 26, 23-24).

7.—Methods in which copper was separated, the iron precipitated as in 6, and the zinc by hydrogen sulphide from an acetic solution and then either weighed or titrated (Mahon: Am. Chem. J., 4, 53).

8.—Waring's method (this Journal, 26, 26-27).

Upon tabulating the results for each sample separately by methods, the authors were able to discuss the data intelligently and to draw certain conclusions, which will not be reproduced, but reserved for a later report, after additional data have been accumulated with respect to method No. 8. The most superficial examination of these tables, which those interested can construct for themselves from the data of Table IV, will make it obvious that some of the methods in common use are not by any means of universal application.

Comments.

The showing of the Tables I to IV is ample demonstration that analytical chemistry, as ordinarily practiced, is anything but an exact branch of the chemical profession. Mr. Waring has furnished additional data from his own experience, to which nearly every chemist could add, showing the lack of agreement that is all too common, often leading to serious consequences, aside from the reflection cast upon the profession at large.

That this is a state of affairs not only of long standing, but long since discovered in certain lines of work is sufficiently attested by the addresses, first of Dr. C. B. Dudley on the subjects of discrepancy in analysis, and standard methods for the analysis of iron and steel,[1] and secondly of Baron Hans Juptner von Jonstorff.[2] Most of the causes underlying variations in results of different chemists have been very fully discussed by these gentlemen, and a perusal or reperusal of their papers and the discussions following them will be time well spent by most analysts. To repeat the substance of them here would lead too far. Suffice it to say that sources of error were pointed out besides the familiar ones of lack of uniformity in samples, poor quality of reagents, etc., or defects in the method or the chemist himself, such as the employment of different atomic weights. This last, while not a prolific source of error, may, as pointed out by Baron Juptner, give rise at times to serious mistakes. That due to poor reagents will, in time, it is hoped, be lessened as a result of the work now being done by a Committee of this Society, in co-operation with the National Bureau of Standards.

With samples of the kind represented by the analyses of Tables I to III, marked errors due to mechanical sorting of once homogeneous materials must, from the very nature of those materials, be out of the question. Even with the zinc ores of Table IV the errors are of such a character as to render non-homogeneity, as well as most of the other ordinarily enumerated causes of error, quite inadequate as an explanation. There is a growing and seemingly well-grounded opinion, which has been given expression by Mr. Thorn Smith and the authors of the zinc report that our methods of teaching are largely accountable for the unsatisfactory state of affairs. There is abundant evidence in the mass of data accumulated by the several sub-committees referred to in support of this view, after making full allowance for the fact that with the best instruction not all students will make good chemists.

Policy of the Committee.

In view of the facts set forth, this committee has adopted the following policy for the guidance of its work, a policy which is subject to change or expansion, as the need arises.

(1) To use every endeavor to impress upon chemists the necessity for such changes, either in methods of analysis or of manipulation, together with a control of the purity of reagents in use, as will make it possible to arrive at greater uniformity in the results of analyses made by different analysts.

(2) To determine whether the lack of uniformity is to be attributed to lack of proper instruction in our schools or to mere carelessness in manipulation, by inviting the co-operation of the instructors in analytical chemistry in the work, distributing among them standard material for analysis, the results of the analysis of which shall demonstrate the accuracy of the method taught by them.

(3) To test, in conjunction with the National Bureau of Standards, various methods, and determine their accuracy and suitability for general use.

It may be said in this connection that the hearty co-operation of the Bureau of Standards has been promised, contingent only on the appropriation by Congress of the funds needed to secure the help of competent chemists. Application for such an appropriation will be made at the coming session of Congress, and it is the desire of the Committee that friends of this movement use what influence they may possess to forward it. This may be done in part, by presenting in writing to the Director of the Bureau arguments in favor of co-operation, especially when strengthened by a clear statement of specific problems whose settlement may have commercial importance.

(4) To prepare samples of materials of different character whose exact composition shall have been determined by the most careful analyses of experts.

(5) To place such samples in the care of the National Bureau of Standards for preservation and distribution to persons desiring to test their methods of analysis or manipulation, or to check the work of students or technical chemists employed in works.

(6) To invite the co-operation of persons interested in the analysis of any particular class of material, by the organization of sub-committees for the preparation and distribution of samples, the chairman of which shall be, for the time being, a member of the general committee and entitled to vote on the subject which his sub-committee has under consideration.

It will not be the policy of this Committee to commit the Society as a body to the endorsement of any methods as standard, but merely to recommend such as may be found satisfactory. Nor will the Committee intrude on fields of work that may be already well covered by existing organizations, such as the Society of Official Agricultural Chemists.

Suggestions as to modifications of the policy of the Committee, or criticisms of it, will be thankfully received.

W. F. HILLEBRAND,
Chairman.
CHAS. B. DUDLEY,
H. N. STOKES,
CLIFFORD RICHARDSON,
Secretary.

ANNUAL MEETING OF THE ASSOCIATION OF AMERICAN PORTLAND CEMENT MANUFACTURERS.

The annual meeting of this Association was held at the Hotel Astor, New York City, on Tuesday and Wednesday, December 13th and 14th, 1904. The Association has a membership of fifty companies or mills, representing a capital of not less than $50,000,000. The output of these mills is over 90 per cent of the total production of Portland cement in the United States. Forty-five out of the fifty mills included in the membership were represented.

The meeting was one of the most interesting and enthusiastic ever held by the Association. The first day's session was devoted to business of the Association; reports were received from the various Committees detailing the work of the Association for the past year. Treasurer's report was submitted, showing a prosperous financial condition.

The most interesting reports were from the Committees on "Uniform Specifications," "Steel Concrete" and "New Uses." The Committee on Uniform Specifications have been co-operating with the Commitees of the American Society of Civil Engineers, American Society for Testing Materials, American Railway Engineers and Maintenance of Way Association and the Institute of Architects.

The result of the reports of these Committees is a report embodying a set of uniform specifications and methods of testing, which have been approved by the Associations interested in the subject.

The importance of the standard specifications is recognized by all, including the manufacturer, engineer and contractors or consumer, and the adoption of the report in question is cause for congratulation.

The Committees on Concrete-Steel reported co-operation with committees representing the Iron and Steel Industries, American Society for Testing Materials, and American Society of Civil Engineers. These Committees are engaged in an effort to formulate standard methods of construction.

It is a recognized fact that the cement industry is open to a certain measure of injury by the possible failure of reinforced concrete-steel constructions, due to improper plans and careless methods. It is to avoid this danger that these several committees are co-operating.

The constitution and by-laws of the Association were so revised as to materially increase the income of the Association. With this increased fund, it is the intention of the Executive Committee to extend and enlarge the usefulness of the Association and encourage chemical research.

During the year, the practice of having papers on subjects of interest to the industry read and discussed has proved interesting and instructive.

The second day's session was devoted entirely to the reading and discussion of the following papers:

"Cement Testing," by W. Purves Taylor.

"Irregular Method of Testing Cement," by H. A. Schafer.

"Some Further Investigations in Regard to the Constitution of Portland Cement," by Clifford Richardson.

"Reinforced Concrete," by Chas. S. Hill.

"Cyclone System of Burning Powdered Coal," by E. H. Stroud.

"Laboratory Work at St. Louis," by Richard L. Humphrey.

The annual dinner was served Tuesday evening, December 13th, at the Hotel Astor. Members and guests gathered about the board to the number of ninety-five. Speeches were made by Clifford Richardson, John M. Goodell and W. Purves Taylor.

THE GERMAN CEMENT INDUSTRY.

At the close of the year 1904 the status of the German cement industry was unsatisfactory. The sales and output both declined notwithstanding the formation of the various individual mills into groups or syndicates which operated within prescribed territorial limits free from the competition of other mills outside of such territory, except in one or more sections where cement may be shipped or sold in the territory of another group or syndicate under certain restrictions and limitations and control of the syndicate into whose territory the cement is to be delivered.

The combinations or syndicates are organized on the following lines:

1st. The Rhenish-Westphalia Cement Syndicate with 25 plants, headquarters at Bochum.

2nd. The South German Cement Syndicate, 26 plants, with headquarters at Heidelberg.

These two syndicates have an agreement to co-operate up to the year 1913.

The following cement mills are bound to co-operate under theRhenish-Westphalian Syndicate. The figures following the names of each individual mill is the allotment in barrels of cement, such mill is permitted to contribute to the syndicate each year under the articles of combination:

No. 1. The Rhenish-Westphalian Cement Works, 340,000 bbls.

No. 2.. Beckum Portland Cement Works, 290,000 bbls.

No. 3. Burner Portland Cement Works, 220,000 bbls.

No. 4. Ennigerloher Portland Cement and Lime Works, 370,000 bbls.

No. 5. Finkenberg Portland Cement and Water Lime Works, 190,000 bbls.

No. 6. Elsa, Newbeckum Portland Cement Works, 340,000 bbls.

No. 7. Lengerich Portland Cement and Lime Works, 270,000 bbls.

No. 8. Meteor Gesker Lime and Cement Works, 195,000 bbls.

No. 9. Portland Cement and Water Lime Works, Mark A. G. Neubeckum, 370,000 bbls.

No. 10. Union Portland Cement Works, 230,000 bbls.

No. 11. Germania Portland Cement Works, 500,000 bbls.

No. 12. Wickingsche Portland Cement and Water Lime Works, 700,000 bbls.

No. 13 Wickeder Works and Portland Cement Fabriek, 120,000 bbls.

No. 14. Westphalia Portland Cement Works, 290,000 bbls.

No. 15. Wesler Portland Cement Works, 300,000 bbls.

No. 16. Rhenische Portland Cement Works, 340,000.

No. 17. Mulheimer Portland Cement Works, 120,000 bbls. Mulheimer Ruhler, 120,000 bbls.

No. 18. Rhenische Bergbau Cement Department, 120,000 bbls.

No. 19. Urbacher Portland Cement and Lime Works, 120,000 bbls.

No. 20. Hoxtersche Portland Cement Works, 300,000 bbls.

No. 21. Hoxter-Godelheim Portland Cement Works, 280,000 bbls.

No. 22. Cement and Lime Works Bestwig, 200,000 bbls.

No. 23. Bremer Portland Cement Works, Porta, 230,000 bbls.

No. 24. Hansa, 100,000 bbls.

No. 25. Portland Cement and Lime Works, Anna, 230,000 bbls.

Outside of the syndicate is the Marjes & Bender Portland Cement Works, which sells under the syndicate. The Stockmeyer Portland Cement Works is not in any way affiliated with the syndicate. This plant produces from 560,000 to 825,000 barrels per year. This does not seriously interfere with the operation of the syndicate.

The Elsa, given as No. 6, in the above list, is bound to the syndicate up to the year 1906.

The works which heretofore have been delivering cement into the South German syndicate territory from the R.-Westphalian syndicate territory no longer do so under a mutual agreement, while a group of 14 mills, affiliated with the South German syndicate, are still permitted to market from 275,000 to 330,000 barrels in the Rhenish-Westphalia syndicate territory, through the South German syndicate sales offices at Dusseldorf, under the supervision of the Rhenish-Westphalian syndicate general sales offices at Bochum.

The 14 plants above mentioned are as follows:

1. Wetzler Portland Cement Works.
2. Budersoche Iron Co.
3. Portland Cement Works, Mieke.
4. Portland Cement, Heidelberg-Mannheimer.
5. Karlstadt Portland Cement Works.
6. Wurtemberger Portland Cement Works.
7. Lothinger Portland Cement Works.
8. Wetteran Portland Cement Works.
9. Ingelheim Portland Cement Works.
10. Fr. Seiger & Co., Portland Cement Works.
11. Offenbacher Portland Cement Works.
12. C. H. Boeking & Co., Portland Cement Works, Malstadt-Burback.
13. Rombach Portland Cement Works.
14. Diedesheim-Neckarelz Portland Cement Works.

The combined capacity is 7,150,000 barrels per annum. Of this amount only 65 per cent. of the capacity has been sold in 1904. These sales include shipments to Holland, Belgium and trans-Atlantic ports.

The Rhenish-Westphalian syndicate will regulate and control all export sales from its Bochum sales offices, from January 1st, 1905, for cement produced within its own territory. A joint sales office has been established at Rotterdam, Holland, for the two German syndicates, and a Belgian syndicate. These three groups will act together on prices and quantities for Holland consumption. Heretofore the sharp competition waged in the Holland markets between the present contracting parties resulting in cutting of prices wherever opportunity offered. The combine will now obtain fair prices in Holland.

The South German Cement Syndicate, with sales offices located at Heidelberg, controls the following works, the quantity in barrels which each plant is permitted to contribute being given in figures after the name of each plant:

No. 1. Heidelberg & Mannheim Portland Cement Works, 1,253,000 barrels.

No. 2. Portland Cement Works, Blaubeuren, 918,000 bbls.

No. 3. Karlstadt, formerly L. Roth, 356,000 bbls.

No. 4. Lothringer Portland Cement Works, 308,000 bbls.

No. 5. Wurtemberger Portland Cement Works, Lauffen, 231,000 bbls.

No. 6. Wetteran Portland Cement Works, 200,000 bbls. with privilege of increasing to 250,000 bbls.

No. 7. C. H. Boeking & Dietzsch, Portland Cement Works, Malstatt-Burbach, 193,000 bbls.

No. 8. Bayerische Portland Cement Works, Marienstein Munchen Co., 183,000 bbls.

No. 9. Rombacher Portland Cement Works, 180,000 bbls.

No. 10. Buderussche Iron Works, Wetzlar, 180,000 bbls.

No. 11. Diedescheim-Neckarelz Portland Cement Works, 165,000 bbls.

No. 12. Ingelheim, formerly C. Kiebs, Portland Cement Works, 160,000 bbls.

No. 13. South German Portland Cement Works, Munsinger, 160,000 bbls.

No. 14. Offenbacher Portland Cement Works, 150,000 bbls.

No. 15. Karlsruher Lime and Portland Cement Works, 130,000 bbls. for 1905; 145,000 bbls. and 160,000 bbls. in 1906.

No. 16. C. Haegele & Son Portland Cement Works, 120,000 bbls.

No. 18. Wetzlar Portland Cement Works, formerly A. Stein & Co., 120,000 bbls.

No. 19. Iron Works, Lollar Portland Cement department, 120,000 bbls.

No. 20. Portland Cement and Clay Works, Mirke, 84,000 bbls.

No. 21. Diedenhoflner Portland Cements Works, Lother, 80,000 bbls.

No. 22. General Cement Association in Dommeldingen, 80,000 bbls.

No. 23. Lime and Portland Cement Works, Walhalla, D. Funk, Reyensburg, 75,000 bbls.

No. 24. F. Sieger & Cie., Budenheim, 75,000 bbls.

No. 25. Kuppenheimer Portland Cement Works, 65,000 bbls.

No. 26. Lime Works, Carl Sebald & Son, 16,000 bbls.

Of the above named works, Nos. 11 and 24 have been purchased by the Heideberg-Mannheim corporation, while Nos. 19, 25 and 26 have been closed under a yearly bonus paid by the South German Syndicate.

The combined capacity of the plants controlled by the South German Syndicate is about 1,110,000 tons, or 5,550,000 barrels, of which 70 per cent was marketed. In this territory all works are controlled by the syndicate with one exception. Agreements have likewise been made with the French & Swiss Cement works to regulate cement shipment over the respective boundaries of those countries. This agreement continues to 1913 when the life of the present syndicates expires.

Dykerhoff & Son alone are outside of the syndicate, as this firm makes higher prices than the syndicate. It does not interfere with the operation of the syndicate. In the Province of Hanover all plants have united, except the Tetonia, of Misburg, which has agreed to maintain syndicate prices for 1905. The Lower Elbe Works, have a combination which does not affiliate with the Hanover group. Competition exists between them.

The Rhenish-Westphalian, the South German and Middle German groups have a working agreement.

The Silesian group operate under an old agreement regulating sales and prices.

The Stettin group have refused to enter any combination. Seven different groups of cement plants now exist in Germany, as follows:

1st, the Rhenish-Westphalian; 2nd, the South German; 3rd, the Hanover; 4th, the Middle German; 5th, the Lower Elbe; 6th, the Silesian; and 7th, the Stettin-Berlin group. Unsurmountable difficulties have been encountered in attempting to unite the seven different groups into one syndicate.

The Rhenish-Westphalian Syndicate has raised prices. $71.40 is now the schedule on 11 tons of cement, being an increase of $14.68 over former quotations.

The syndicate allows 4 3-4 cents for empty sacks with free return. Central points are being established to facilitate the handling, cleaning and mending of sacks.

Rebates are to be given on sales of cement in accordance with the quantity purchased during the year, the greater quantities purchased the larger will be the rebate, which will be distributed at the close of each year.

The syndicate requires each purchaser to sign an agreement which prevents such customer from using and disposing of the cement outside of the territory designated in the bill of sale and subject to the following restrictions and penalties:

1st. The purchased is not to purchase cement outside of the syndicate territory in which it is to be used.

2nd. No purchaser can order in quantities of 55 tons without first having the consent of the syndicate in whose territory it is to be used.

3rd. The purchaser cannot buy or sell or offer for sale cement to persons selling brands of cement not made by the syndicate, or to persons using other brands.

4th. Cement cannot be reshipped from the station designated in the contract, to another station, not named in the bill of sale. The purchaser must in every case designate where the cement is to be used, in case of reshipment by the purchaser, the syndicate is empowered under its contract of sale to impose a penalty of $11.90 on each 11 tons of cement delivered for violating the clause, As these restrictions cover only the year 1905 their successful operation cannot be determined until 1906.

The state of the German cement industry at the close of the year 1903 was not flattering. Only 22 plants out of a total of 68 declared a dividend; 46 plants did not declare any dividends, while 16 plants suffered considerable loss. Under these conditions, something had to be done to prop up a once flourishing industry, hence the foregoing restrictive regulations as to sales and distribution of cement were established.

Last season prices were rather satisfactory due to the revival of the building industry, while the contemplated new Rhenish-Hanover canal, gives promise of better prices for the North German cement industry. The export trade has shown a steady decline from these works during the past three years.

Exports from Germany: 1901, 2,533,260 barrels; 1902, 3,207,197 barrels; 1903, 3,432,997 barrels.

Imports: 1901, 434,314 barrels; 1902, 259,736 barrels; 1903, 249,119 barrels.

Excess of exports over imports: 1901, 2,098,946 barrels; 1902, 2,942,461 barrels; 1903, 3,183,733; which shows that the imports have steadily declined, while the exports have increased.

The exports for the first 10 months of 1904 were 2,404,678 barrels, against 266,280 barrels imported for the same period, which indicates a decline in exports of 625,000 barrels due to the decline of exports to the United States, which was only 418,631 barrels for the first 10 months of 1904, against 1,011,891 for the same period in 1903. It would seem that the Rheinish-Westphalian Cement Syndicate has made prices too high under the present conditions of the market as it will tend to promote the erection of new cement plants which will make inroads upon the monopoly. Such high prices will likewise restrict consumption. The syndicate having increased its price on all cement sold at Cologne sales office, $3.60 over the price asked at Bochum or Dortmund, over and above the freight charges, as there points could be reached by water at much lower rates from the south German Syndicate works. Yet the $3.60 freight rate applies to all such shipments in the vacinity of Bochum, while the Cologne sales office exacts $4.08 more per hundred barrels on cement used at Portz where it is made by the Rheinish Portland Cement Works than at Bochum. The syndicate should make a uniform rate at the various mills to give the consumer the benefit of the lowest rail or water rates obtainable. This would give Cologne and Dusseldorf consumers the same advantage as in the Westphalian territory at Bochum.

PRACTICAL WORK OF CONSTRUCTING SIDEWALKS.

Read Before the Cement Users' Convention, Indianapolis, Ind.

The specifications uniformly given by myself for cement sidewalk-paving are: First, excavate to a uniform depth of eleven inches below the finish grade; Second, fill with stone-coal cinders (not ashes) seven inches when well rammed to place; when the concrete is ready dampen the cinders to prevent absorption of water from the concrete; Third, on the top of the rammed cinders fill three inches deep with cement concrete prepared as hereinafter described, when thoroughly rammed to place; Fourth, then finish with one inch of fine cement mortar as hereinafter described . The fine cement-mortar is made (all parts by bulk) of one part of Portland cement to two parts of clean sharp sand, mixed *dry* in a water-tight box. The concrete is made of five parts of durable stone crushed to a three-quarter inch mesh and thoroughly screened to one part of the aforesaid fine cement mortar. In mixing the concrete first place the stone on a large water-tight platform, then wet thoroughly, then apply the fine cement mortar (dry as yet) and mix until every particle of the stone is coated with the fine cement mortar, and apply to the work at once, thoroughly ramming to place. While the concrete is being rammed to place sufficient of the fine cement mortar should be wet enough to move freely under the trowel, immediately applied to the work, thoroughly troweled down against the concrete, "rodded-off" with a straight-edge held so as to compress the mortar, and rough-finished with a plasterer's trowel. The work will then be left for the finisher who will first "float" the work to a uniform surface and then give it a good polish with the trowel. Gravel with no pebble larger than three-quarters of an inch may be substituted for the crushed stone before named, and where the gravel has sufficient sand of good quality mixed with it, naturally, the concrete may be made by mixing the Portland cement, one part to eight, directly with such fine gravel, first *dry* and then wet only enough to pack solidly and then immediately applied to the work.

Very simple in the telling and quite true, but it doesn't necessarily secure good work, hence we need to consider some of the requisites that can not be entered-up in the written specifications. The first is a council that will stand by the engineer in his effort to secure good work. The people pay for good work and the council should see that they get it. The next requisite is a city engineer with a back-bone, one sufficiently stiff enough to discharge an unfaithful workman "instanter," and to compel the contractor to realize the very important fact (to him) that poor cement work is dear at any price.

The selection of the materials should be left entirely to the engineer. As to the Portland cement one can only say that, it is usually sound. I have found no such difference as is claimed by the various makers and by many cement users. Different "brands" work differently, but good results can be had from any. I have found it best to give the workmen that brand with which they best like to work. As to stone or gravel, I can say only that it must be durable. Many kinds of stone "airslake" and dissolve out of the work. To say "clean sharp sand" is sufficient, but some may not know just what is meant by "sharp." It means a sand that shows acute angles under the microscope and so hard that when rubbed between the thumb and fingers none crumbles and no dust forms. It should give a good, sharp, clean ring dhen handled with a shovel. But let me give you my test. Mix your cement and sand in such proportions as to bring out a plainly discernable "slate-green" color. If you can not develop that color, get sand with which it can be done. With that you are assured of good work, without it you are not. It is the opinion of your writer that more defective work is due to a poor quality of sand than to all other causes combined. Too much insistence can not be made that all the materials *must* be clean. The entire virtue of cement is in its adhesiveness. If the materials are not clean the adhesion will not take place. This particular applies to the water as well as to the other materials.

Some critic may here say that he has had good work from sand which showed considerable color on the hand and that made the water yellow when thrown into it. Quite true, and quite untrue. The result is apparently, in many instances, better work. But it is only in appearance. The clay which makes this color is not calcined and sooner or later dissolves out of the work with corresponding loss of strength. Many years ago masons and plasterers learned that with a clean sharp sand and well burned lime as good results were not had with clean water as with water to which some yellow clay was added and well stirred in before mixing with the lime and sand.

The substructure of the sidewalk may be of the natural surface, crushed stone, gravel or cinders. The essential point is to secure drainage. If that can not be had in any other way drain tile must be used. Your writer prefers cinders because they part with the water more readily than do other materials and with them there is no tendency to the formation of "frost-nails" which is the prime cause of cracking of the work. Just here I want to enter a protest against the use of deep-tongued tools in finishing between the blocks. The usual specifications for dividing the work into blocks are: Divide the concrete into blocks of not more than 25 square feet area with a sand joint not more than 1-2 inch wide. Also divide the finish coat into like blocks with the joints exactly over the sand joints in the concrete *with a trowel-cut only* and finish with a marking-tool having a tongue not more than 1-4 inch deep nor more than 1-16 inch thick and joined to the plate with a radius of not more than 1-8 inch. Yet I frequently find men using a marker having a tongue an inch deep and a quarter of an inch thick. The theory for this is that the deep cutting prevents cracking beyond the "cut." It doesn't; hence the theory is incorrect. The "trowel-cut" makes a permanent division in the top coat. The shallow marker presses the edges close together, but they do not unite, and so prevents the entrance of water into the joint; hence there is no expansion to push the blocks apart. Great care should be had that none of the dry sand used in making the "sand-joint" in the concrete is permitted to fall upon the top of the concrete. If it does it will prevent the "cap," of fine cement mortar, from uniting with the concrete and the "cap" will be loose and be liable to crack off to that extent.

Among the workmen are some requisites that can not be written in the specifications. Oftener than otherwise among the common laborers will be found a better "stripper" than among expert carpenters. It is just a "knack" in setting the side-rails for pavements and backs, fronts and divisions for curbs and gutters, that some men have and others do not. Again every mason and plasterer knows that there is much in the "tempering" of the mortar and a good mason or plasterer demands the services of some one whom he considers to be an expert at that work. It is all in the "look" and the "feel," and some men have the "knack" for it and others do not. Usually it is best to employ an expert "finisher," but, often, among the day laborers will be found a man who will readily get the "knack" of knowing just *when* to apply the float and just *how* to apply the trowel to get a fine finish upon the work.

To Councilmen, I would say, "cut out" your superintendents. Usually political favorites, rarely with any practical knowledge, and wholly without any legal power, they are more a hindrance than a benefit to the work. Make your engineer responsible for good work. If he needs supervision assistants, let him select them and make him responsible for their acts.

In regard to proper "tamping" and "ramming," both the tensile and the compressive strength of the work are largely dependent upon this one thing and everybody can not do it. The rammer is usually an iron plate with an upright handle. It this falls but a very little diagonally it stirs up the work instead of compacting it. Among any ten common laborers will be found at least one who will be found with the knack of dropping the "rammer" square upon the work. He who can do this will have no "jar" from the handle to his arms and the dread of the tool, which most laborers have, will entirely disappear. Such a man will do twice the work of others and do it well where the others do not, and do it satisfactorily to himself. In crushed and screened "Blue hole" oolitic Indiana limestone, granite, marble and other fine building stones, you have the materials, which, combined with Portland cement and suitable sand, will produce better and finer effects in both internal and external architecture, than are produced by the natural stones, and at a much less cost. These artificial stones will receive as fine a polish as the natural stones, if you will but study how it is done.

About Repairs.

Where cement work is broken, remove the broken part and cut away to a *clean* surface. Then dampen this clean surface and cover very lightly with dry cement and immediately apply the new material which is to take the place of the part removed, and finish as at first. If a part of the work becomes worn and presents a coarse, rough surface, it is because the finish coat was not properly "tempered" in the making of the work. The best remedy is to take equal parts of unslaked lime and Portland cement, and, within a spell of fine weather, sprinkle lightly all over the worn places, and leave it to be kicked about by the feet of passers-by until after a rain. Much surer effects will be attained by making several applications than by applying all at once.

Albert T. Gridley, C. E., Aurora, Ind.

REINFORCED CONCRETE.

Read at the Northwest Concrete Products Convention, Minneapolis.

By C. A. Turner, M. Am. Soc. C. E.,
810 Phoenix Bldg., Minneapolis.
Minn.

Gentlemen:

In greeting you this evening I desire to express my hearty sympathy with the object of our Convention, to disseminate popular information regarding the use of Portland cement. The industry and enterprise of the American Portland cement manufacturer has now placed at the disposal of the enterprising engineer or builder, a thoroughly reliable material when properly handled which bids fair to replace timber and strutural steel in buildings and short span bridges.

In making this statement the writer will say frankly that the view expressed is the result of eighteen years practical experience in building and structural work, as draughtsman, contractor and designing engineer. For the past ten years the writer has followed closely each and every structure in concrete steel that came to his attention, but it has been only of late that he has been in position to place the result of his study in the form of reinforced concrete structures, which will be illustrated later.*

In treating the subject from the popular standpoint, the writer would first say a few words as to the reliability of the construction as compared with steel or timber. Ignorant abuse will render dangerous the best material which the engineer uses,—for example,

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*[This will appear in our next issue.]

—some months ago the writer was called on to inspect some coupler pockets forged out of 1 1-4 x 4 inch bars made by a Pittsburg company. They were worthless, the writer was told, and going to the pile and selecting four, they were placed on the ground and struck a few sharp blows with a sledge, a single blow fractured 10 square inches of metal in two cases. In normal condition this area would carry 600,000 lbs. in tension. Taking the shank to a steam hammer, the center was bent flat on itself without fracture proving that the smith had burned the steel in forging, until it was worthless at the bend.

Similar inexcusable ignorance in working concrete will likewise result in inferior work, but by no means to such an extent as that instanced in the case of the steel.

The mistake that is made by many in fabricating reinforced concrete is the endeavor to get strength with a cheap concrete. A common proportion is 1 cement, 3 sand, 5 stone—a mixture much too poor to secure the best results, or the greatest strength for a medium cost. A mixture of 1 cement to 2 of sand and 2 broken stone of size from a pea to that which will pass a three-quarter inch screen is to be preferred. The stone should be screened, if limestone, otherwise the dust such as that of trap rock or granite may be used in lieu of sand. By making this mixture wet enough to flow slowly and require no tamping whatever, the question of poor workmanship while the material is mixed by machine in exact proportions is entirely eliminated; any laborer you may employ who can dump the car and level off the cement will do as good work as can be done.

Such concrete three months old should give a value in compression of 2,500 lbs. per inch, or more, without reinforcement. In the form of a column, if constrained laterally, Considere has shown that this crushing strength can be increased five fold, or more, dependent on the reinforcement.

The principle of this reinforcement is this: If we take a light sheet metal cylinder and fill the same with sand, the cylinder will support a load on the sand much greater than it would empty, since the metal is in tension and the filling with the lateral restraint carries the load.

Now were the metal shell square, evidently the sides of the shell would bulge sidewise under the internal pressure—similarly any attempt to hoop a reinforced column with a square hoop is an amusing absurdity, the slightest lateral bending removing the necessary restraint.

At first thought it might seem that a continuous cylindrical shell would be the best means of reinforcement, but the vertical metal being more rigid than the concrete, would be strained to its limit before being brought into action in its capacity of lateral reinforcement, hence the undesirability of attempting to make the vertical reinforcement used continuous, 1. e., without some concrete between ends where this principle is to be employed, or making the reinforcement in form of a spiral coil as recommended by Considere.

The criticism that may be urged against some of these forms of reinforcement appears to the writer to be in the failure to make a good connection to the beams. For that reason the reinforcement advocated by him is in the form of a grill of vertical rods banded at intervals by strong riveted hoops with one of the rods bent outward into each beam, connected to and supported by the column, and the whole wrapped or hooped with netting.

As in this country the use of concrete construction is in its earlier stages, it is not surprising perhaps, that many of its advocates are imitating the methods of framing required for construction in entirely different materials, rather than forms and proportions peculiarly adapted to reinforced concrete. Mr. Humphrey in his excellent talk yesterday emphasized in connection with bridges the effort to bury a structural steel frame of sufficient strength for the load in concrete and term the clumsy conglomeration, reinforced concrete.

In the structural line we have attempts to reinforce structural steel with concrete, to put in beams as thick as required for the old fashioned wood framing, attempts to reinforce in one direction only, forgetting that in a monolithic mass of the size with which we are dealing, temperature stresses must be provided for in the reinforcement of the work so as to make it stand without cracking.

In designing reinforcement of beams, advantage should be taken of the principle of continuity, since with the constant section we have to provide only for two-thrids the moment of a simple beam and we have but one-fifth of the deflection, for the beam fixed at both ends that we would have for a simple beam.

This system of design calls for the major section of the metal for flange reinforcement over the support and furnishes ample provision for shear.

In construction work in this line it is well to bear in mind that centering is a considerable item and that each additional beam is an extra expense. While we may not discard beams for heavy work for light loads, such as two to four hundred pounds per square foot, we may make a simple slab from column to column spacing 16 to 18 ft. running main lines of reinforcement from column to column, directly and transversely with lighter fabric between these lines, all buried in a slab of uniform thickness.

A few words regarding the interesting peculiarities of reinforced concrete. We will shortly illustrate a panel which under 82 tons load showed absolutely no deflection whatever. Now the materials with which we deal in engineering work are elastic, why then such deportment of these beams? In setting up, the concrete shrinks and the rods reinforcing the bottom of the beam are actually in compression, also the top of the beam in tension due to internal stress. Until this condition is counterbalanced we could then expect no elastic deformation. This feature of the deportment of reinforced concrete is worthy of serious consideration by those who contemplate using shapes of irregular form as reinforcing members.

In crushing, concrete usually shears at an angle approximately forty-five degrees to the direction of pressure, hence plain reinforcement, either parallel or at right angles to the line of pressure has a marked influence on its strength.

To return to the more popular phases of the question of reinforced concrete: Can it be figured with accuracy? And do we know enough about it to use it with safety? The answer is emphatically in the affirmative. The engineer can figure the strength with the same degree of precision certainly, that he can timber construction, while if the tensile value of the concrete is disregarded as is in good practice, the error is invariably on the side of safety.

How does reinforced concrete compare in cost with older styles of construction? For heavy buildings we can compete with wood when the working load is 500 lbs. per square foot or more.

For lighter loads we can compete at a good profit with any of the older forms of fireproof construction, saving the owner the cost of the entire steel skeleton .

For loads greater than 800 lbs. per square foot it is cheaper than timber if both are made of equal strength.

As regards its fireproof properties there is nothing in use which equals it.

At the Paris Exposition the Hennebique Company erected a cement concrete building in which to test both the strength of the floors and their resistance to fire when loaded. The first floor was loaded to three thousand pounds per square yard. The upper floor to two thousand pounds. The deflection was barely 1-25 of an inch. A big fire of cord wood and oil was started on lower floors and kept at full intensity for an hour, and although the heat developed was 1800 degrees F., yet the temperature on the floor above the fire only increased about four degrees, showing that merchandise would not have been injured in such a position. At the end of an hour the deflection of the heated ceiling had increased to one-fourth inch. Then the whole building was drenched with water, and two hours later the load was removed whereupon a rise of one-half inch took place showing no permanent deflection or injury to the construction.

The construction of reinforced concrete is supposed by many to be slow business while as a matter of fact in no system of construction can the materials be as promptly obtained or the work more rapidly pushed. The cement and rods can be obtained, if necessary, at a week's notice and the rough timber for forms is a stock proposition. A single half-yard mixer and suitable crew can readily erect a story with a floor of 16,000 square feet area in a week's time with fair weather.

To the contractor who has vainly tried in our cold climate in winter to conglomerate 16 parts of frozen sand and gravel with one part of cement—plus ice water, and produce smooth concrete work, the idea of putting in satisfactory reinforced concrete in winter seems an impossibility. He is respectfully referred to the paper of W. A. Rogers, read before the Western Society of Engineers, who concludes from the tests that exposing freshly mixed Portland cement to a freezing temperature seems to offset its rate of hardening making it slower, but eventually the concrete will be just as good as if it had not been exposed to the cold. A conclusion in accord with the writer's experience.

As the object of this convention is the promotion of the cement industry, a few notes on experience in promotion of a few concrete constructions may be of interest.

We call on our friend, the outspoken, honest old-fashioned architect and inquire if we may be favored with an opportunity to figure on his elegant five story warehouse—well, he hadn't considered concrete—but what size would you make the columns?

—He glances at you curiously, apparently to see whether you have a few loose gears sticking through the epidermis covering your thinking machine, and wants to know,—whether you concrete men are plumb crazy.

You next see an owner and after getting him interested and convinced of the merits of your construction and your ability to give a bond for the full amount of the contract he takes advice of some contractor who with absolutely no experience in this line wisely advises him that the work could not possibly be executed at this season in cement in order to carry out the work himself in wood—and so it goes.

RAILWAY TRACK ELEVATION IN CHICAGO.

City ordinances now in force call for the elevation of 138 miles of road bed, of which about 91 miles have been completed. The total number of miles of single track to be laid on the 138 miles of road bed will be 710 miles, and of this, 447.95 miles of single track have been completed. The entire track elevation calls for 537 masonry subways under the right of way at street crossings, of which 362 have been completed up to Dec. 31, 1904. The estimated cost for the entire work is $44,240,250. The cost of the work done to date is $28,802,250.

Ordinances passed in 1904 call for the elevation of 17.25 miles of road bed in addition to the above, upon which 50 miles of single track will be laid, pierced by 83 additional subways. The estimated cost of the new work under the ordinance passed in 1904 will be $4,450,000, making the entire cost of the work when completed $48,690,250, all to be defrayed by the railway companies owning the right of way.

INFLUENCE OF GROUND IRON ORE ON THE STRENGTH OF CEMENT MORTAR.

It has been customary to add a given portion of powdered iron ore in the finishing coat of cement work to be subjected to heavy wagon traffic in order to insure stronger work.

Tests made in the laboratory of the Tonindustrie Zeitung and compared with a mixture of 1 cement to 3 of normal sand did not show as high results in tensile or compressive strength as an admixture carrying iron ore. The iron ore gave the test-pieces greater density as well as greater strength.

The laboratory tests on pieces 30 days in water gave the following results:

1 Portland Cement, 3 Normal Sand, Kg. per Cubic Centimeter.	1 Portland Cement, 2.75 Normal Sand, 0.25 Iron Ore, Kg. per Cubic Centimeter.	1 Portland Cement, 2.75 Normal Sand, 0.25 Powdered Sand.
328	408	493
308	378	521
319	378	535
309	388	416
308	382	526
317	391	500
323	395	484
322	403	468
305	421	465
318	401	462
Av. 315.7	Av. 394.5	Av. 487.0

The abrasion or rubbing test on the three different mixtures 30 days in water gave the following results:

1.—1 part Portland Cement, 3 parts norman sand; loss 18 grams.

2.—1 part Portland cement, 2.75 parts normal sand, 0.25 parts ground iron ore; loss, 16 grams.

3.—1 part Portland cement, 2.75 parts normal sand, 0.25 parts ground sand meal; loss, 13 grams.

Which shows that the highest in compressure strength and resistance to abrasion is found in the addition of 0.25 of sand meal due to the filling up of the voids between the sand grains.

REINFORCED CONCRETE LIGHT-HOUSE.

The Russian government has erected in the Gulf of Riga, near the Port of Riga, Russia, a circular light-house 131 ft. high by 28 ft. diameter at the base, which contracts to 6 ft. 7 ins. at the top, above which rises the lantern. The service room just below the lantern overhangs the walls 3 ft. 10 ins.

The shaft or tower was calculated to resist a wind pressure of 564 pounds per square foot. The foundations are carried 8 ft. 3 ins. below the ground. The steel reinforcing consists of tension rings and upright bars to distribute the pressure more evenly upon the tension rings. The concrete encasing the steel skeleton in the walls was mixed 600 pounds of Portland cement to each cubic yard of clear sharp sand and gravel, care being taken to imbed and surround the steel bars with a rich cement mortar to insure a perfect bond between the bars and concrete.

The use of reinforced concrete resulted in a saving of fully 40 per cent over other masonry construction. The concrete in the structure weighed 342 tons, and the steel used for reinforcing weighed 111 tons, the total weight of the structure being 453 tons, while the structure constructed of stone masonry with a less factor of safety would have required 1.343 tons of material, or a direct saving of 890 tons by the use of reinforced concrete, or about two thirds less than stone masonry, and at a saving of fully 40 per cent as before stated over other forms of masonry construction.

The Alma Cement Co., of Wellston, Ohio, have abandoned the use of rolls for the preliminary reduction of clinker and have substituted for coarse grindings the Smidth Kominuters manufactured by F. L. Smidth & Co.

The conditions confronting cement manufacturers at this time of severe, competition and low prices call for the careful consideration of every phase of the making of their product with a view to not only improving the quality but at the same time increasing the efficiency of the mechanical equipment in order to obtain economical production. That cement manufacturers are fully alive to the situation and are making important changes and contracts for the installation of machinery to a large extent is shown by the recent orders received by F. L. Smidth & Co., of New York. Last week they made one shipment to the Lehigh Portland Cement Co., at West Coplay, Pa., of seven carloads containing 3 Smidth Kominuters and 4 Davidson Tubemills, to be installed in the revision of the mill "B" plant. In addition to this they have taken the order of the same company for 18 Kominuters and Tubemills for use in the raw and clinker departments of the new mill "G" to be built in Southern Indiana. They have also contracted with the Lawrence Cement Co. of Pennsylvania, to do the engineering work and supply the grinding machinery for the large extension to their plant in Siegfried, Pa.; Kominuters and Tubemills will be used for both raw and clinker grinding. Orders for Kominuters and Tubemills have been received from J. B. Speed & Co., of Louisville, Ky., for their new Portland cement plant at Speeds, Ind., the raw material and clinker grinding being done exclusively with these machines. The Elk Cement & Lime Co. will reconstruct their mill at Elk Rapids, Mich., using the dry process instead of the wet process as heretofore. Smidth & Co. are doing the engineering work as well as supplying some of the grinding machinery.

MARQUETTE COMPANY HAD PROSPEROUS YEAR.

It is learned that the Marquette Cement Manufacturing company of La-Salle, Ill., have had another very prosperous year, having reduced their bonded indebtedness over $50,000, expended some $50,000 in enlarging their plant and carrying $45,000 to surplus account.

The aim of this company has apparently been to manufacture the highest quality of Portland cement, commanding the highest price and the results of these efforts seem to have been entirely satisfactory.

The output the coming year will be something over 500,000 barrels, the largest output of any Portland cement works in the state of Ilinois.

NEW CEMENT BUILDING BLOCK FACTORIES.

Alabama.

W. W. McAfee, Anniston.

California.

SanDiego Cement Products Co., San Diego.

Georgia.

Americus Tile & Artificial Stone Co., Americus.

Illinois.

Trompeter & Weberling, La Salle; John Aden, Havana; E. D. Clark & Son, Carrollton; John Chase, Anna; R. G. Riser, Kankakee; Thompson & Smart, Waukegan; E. J. Ailes & Co., Viola; W. D. Prietz, Sterling; Monroe & Morgan, Washington; E. M. Fox, Mt. Carroll; Colladay & Leonard, Decatur.

Indiana.

Frank B. Hughes, Franklin; Cotton & Lemasters, Shelbyville; Wade & Son, Mishawaka; R. M. Wigton, La Grange; Knapp-Davis Co., Richmond; Walter Regan, Lebanon.

Iowa.

Nathan Schee, Des Moines; Henry McGowan, Clear Lake; J. O. Burrington, Pocahontas Center; Balger Artificial Stone Co., Des Moines; Heigel & Gilmore, Tipton; A. D. Beaver, Manly; Shirely & Gunn, Bourbon; Trussell & Kydd, Reinbeck.

Kansas.

McPherson Cement Block Mfg. Co., McPherson; Blue River Construction Co., Independence; J. F. Funk, Chanute.

Michigan.

National Sand & Cement Block Co., Adrian; McGrath, Frost & McGrath, Hemlock; Williamston Cement Block & Brick Co., Williamston; Petoskey Block Mfg. Co. ,Petoskey; Elbert Welch, Gladstone; George Kime & Sons, Hartford.

Minnesota.

Boyd & Erickson, Bemidji; W. P. Butler, Minneapolis; Spiess & Son, Fairfax; Cement Bldg. Blk Co., Plainview; Croopston Brick & Tile Co., Minneapolis; Matt Hedlund, Olivia.

Missouri.

Walton Granolithic Stone Co., Kansas City; Z. Fielder & Son, Hannibal.

Nebraska.

Jackson & Crum, Osceola.

New Jersey.

New Jersey Cement Stone Co., East Orange.

New York.

LeRoy Foulkes, New York; W. J. Genthner, Despatch.

Ohio.

Hollow Stone Cement Works, Lancaster; S. A. Buchanan, Bellefontaine; Scott Lumber Co., Bridgeport; Bucyrus Cement Building Block Co., Bucyrus; Cement Block & Supply Co., Marietta; Belmont Sand Company, Shadyside; Youngstown Artificial Stone & Cement Co., Youngstown.

South Dakota.

J. F. Reed, Deadwood; Stover & Englesby, Watertown; Watertown Cement Product Co., Watertown.

Wisconsin.

B. H. Shew, Princeton; Geo. L. Smith, Wasaw; Joseph Shimek, Appleton; Lenz & Fuerbringer, Jefferson; Green Bay Improvement Co., Green Bay; J. F. Anderson, Chippewa Falls.

INCORPORATED.

The National Sand & Cement Block Co., Detroit, Mich.; capital $50,000.

The Miracle Pressed Stone Company, Sioux Falls, S. Dak.; capital $200,000; capital in Illinois, $10,000.

American Brick Cement Co., Portland, Me.; capital $1,000,000. President M. W. Baldwin; treasurer, J. J. Hernan, both of Portland.

Ft. Wayne Cement Stone Company, Ft. Wayne, Ind.; capital $5,000. Directors Julius Remus, L. Charles Jocquel, Wilhelmina Remus.

The Koenig Concrete Company, Milwaukee, Wis.; capital $15,000. Incorporators Charles H. Koenig, Peter Koenig and M. D. Kelley.

Todd-Conway Concrete Construction Co., of Kansas City, Mo.; capital $2,000. Incorporators, N. C. Todd, Wm. Conway and E. M. Todd.

The Tulsa Cement Stone Manufacturing Company, of Tulsa, I. T.; capital $20,000. Incorporators Charles O. Frye, M. A. Frye, and Samuel Webster.

American Cement Construction Co., Milwaukee, Wis;. capital $10,000. Incorporators F. D. Quinn, F. J. Weickmueller and Fred J. Rodee.

The Milwaukee Concrete & Supply Co., Milwaukee, Wis.; capital $5,000. Incorporators James S. Sanborn, Samuel D. Austin, and Frank W .Ehlert.

The National Concrete Construction Co., Louisville, Ky.; capital $25,000. The incorporators are J. B. Ohligschlager, Webster Gazley and B. H. Haming.

The Chicago Artificial Stone Company, Chicago; capital $20,000. Incorporators Wm. Gleck, W. A. Williams, G. W. Cole, T. W. Buzzard and W R. Southard.

The Elm Creek Hydraulic Stone Co., Elm Creek, Neb.; capital $1,000. Incorporators are C. A. Willis, George Miller, L. G. Mackenzie, L. P. Wells and F. W. Barney.

Alamo Cement Company of San Antonio, Tex.; capital $20,000. Incorporators Dr. Fred Kalteyer, Charles Baumberger, J. W. Cook, Albert Kronkosky and Nic Belker .

The Lake Erie Cement and Construction Company, Norwalk, O.; capital, $50,000. Incorporators, W. T. Hood, J. W. Chesround, J. F. Hufford, C. A. Peach, W. H. Oden.

Granitoid Construction Co., Nashville, Tenn. Objects, to manufacture concrete block, etc.; capital, $25,000.

Incorporators W. N. McDonald, president and general manager.

The Wisconsin Portland Cement Co., Portage, Columbia county, Wis.; capital $750,000. Incorporators Prof. S. M. Babcock and Joseph M. Boyd of Madison, and F. H. Merrell.

The Cement Block and Supply Co., Marietta, Ohio; capital $10,000. Incorporators O. R. Ballard, C. J. Van Valey, John L. Mills, T. J. Hadley, J. D. Arbour and Peter J. Sult.

The Youngstown Artificial Stone Co., Youngstown, O.; capital $25,000. Incorporators Timothy Behan, John T. Cantwell, W. E. Lucdy, A. J. Loftus, J. W. Cumisky and John F. Hynes.

The Beverly Cement Co., Beverly, O. Capital, $5,000. The incorporators are Fred H. Hart, Harry Crooks, E. D. Leget, E. W. Webster, J. A. Hart, J. C. Crooks, H. K. Flowers, E. P. Langenberg.

Standard Ferro-Concrete Co., New York, N. Y. Objects, to manufacture concrete slabs, etc.; capital $75,000. Incorporators and directors for first year P. B. Cavanaugh, A. G. Bradford, Clyde Colt.

The Minneapolis Paving & Cement Brick Manufacturing Co.; capital $100,000. Incorporators P. J. Nyvall, John Olson, Andrew Anderson, August Anderson and J. L. Beckman, all of Minneapolis.

Missouri Lime & Cement Co., Jersey City, N. J.; objects, manufacture and sale of cement, plaster, brick, etc.; capital $50,000. Incorporators, C. L. McDonald, Louis B. Dailey, H. C. Coughlan, Jersey City.

The Cumberland Hydraulic Block & Stone Co., Cumberland, Md. Objects, to manufacture concrete blocks; capital, $5,000. Incorporators Andrew Heller, James C. David, Charles Heller, Robert H. Gordon and Arch A. Young.

C. A. Rupp Building Construction Co., Buffalo, N. Y., to manufacture and sell Portland cement, lime, brick, lay sidewalks, pavements, etc.; capital $5,000. Directors Charles A. Rupp, Fred Luedeman, Fred J. Luedeman, William H. Schmidt, all of Buffalo.

The West Liberty Concrete Co., West Liberty, Ia. Objects, to make and sell stone, sand and cement posts, sidewalks, curbing, paving, foundations and to erect buildings, etc. Capital $10,000. Incorporators W. M. Lambing, F. A. McDonald and H. N. McDonald.

The Sioux Rapids Electrical Concrete Fence Post Company, Sioux Rapids, Iowa. Objects, to manufacture cement and wire fence posts and building and sidewalk blocks: capital $5,000. Board of directors J. H. McCord, J. E. Durkee, J. W. Higgins, C. G. Conley and D. C. Skinner; J. H. McCord, president; J. E. Durkee, vice-president; F. H. Helsell, secretary and treasurer.

The Righter-Marshall Company of Mineola, N. Y., has been chartered with the State Department, to deal in coal, coke, cement, etc. The capital stock is placed at $50,000, consisting of shares of $100 each, and the directors for the first year are as follows: Walter L. Righter, Wilbur A. Marshall and Brian Evans, of Mineola.

Messrs. W. L. Macatee & Sons, of Houston, Texas, representatives for the Alpha Portland Cement Company, of Easton, have been awarded contract for furnishing 114,000 bags of Alpha cement for use of J. M. O'Rourke & Co., who are to construct about one mile of sea wall extension for the United States government in front of the fortifications at Galveston. This cement, 10,830,000 pounds, which would lay a four-foot sidewalk sixty-seven miles long, would make 450 car loads of 24,000 pounds each or over twenty-two train loads of twenty cars each, the total length of which, including twenty-two engines, tenders and cabooses closely coupled together, would be over three and one-half miles.

The Stevens Point Aritificial Stone & Brick Co., Stevens Point, Wis. Objects to manufacture artificial stone or brick; capital $5,000. President, Dan Corlett; vice-president, T. H. Hanna; secretary, Henry Ambrose; treasurer, T. H. Hanna; directors, A. T. Johnson, J. W. Moxon, Frank Slosser, H. Ambrose and T. H. Hanna.

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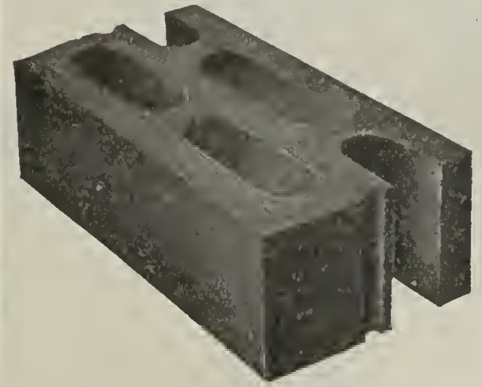

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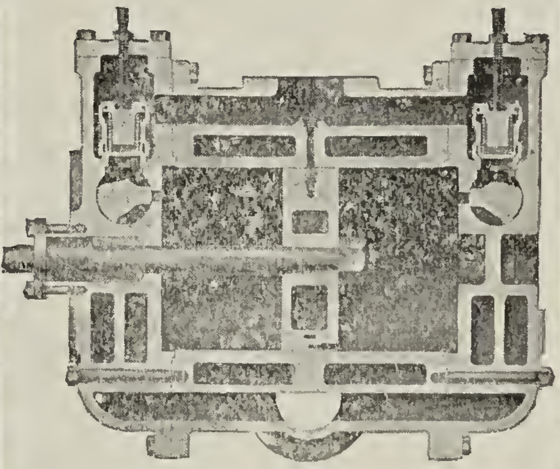

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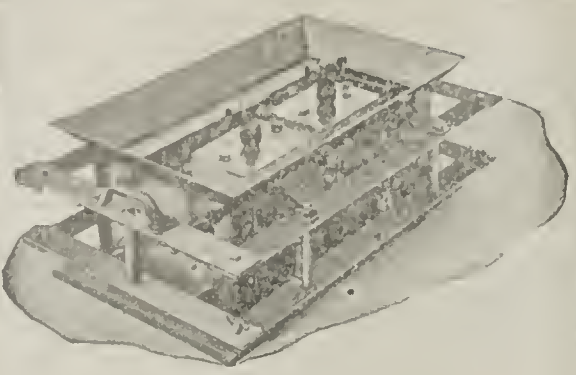

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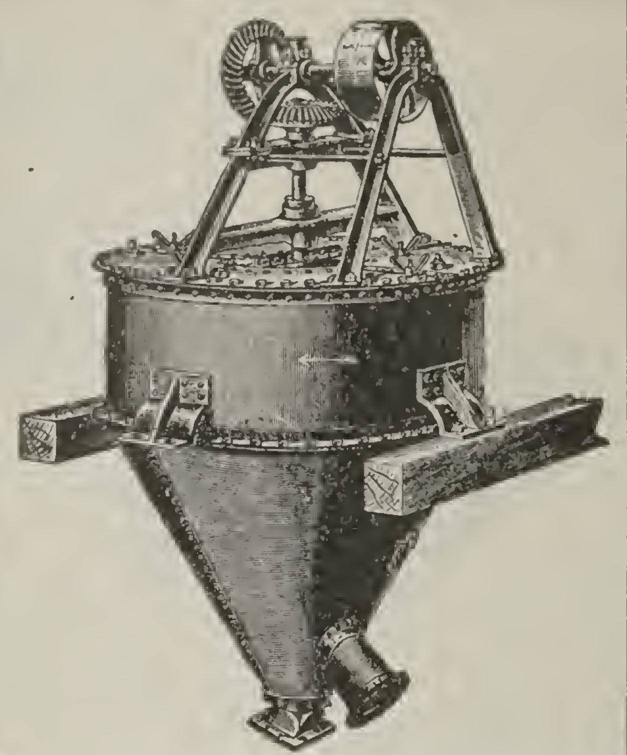

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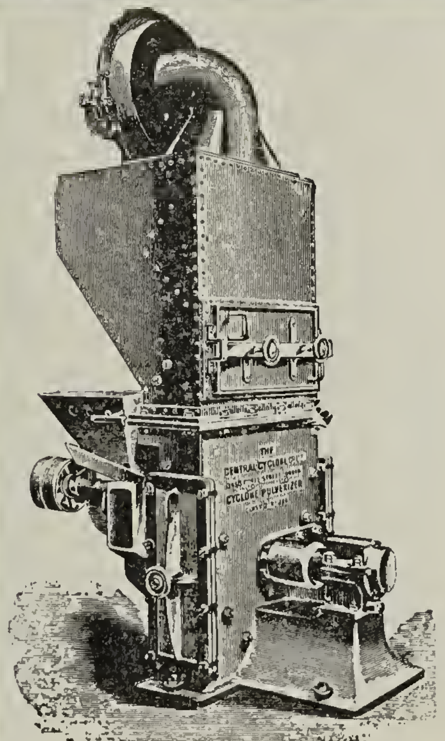

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that if they could use in their cement block machines a composition of coarser material, such as crushed stone, coarse gravel, etc., they could produce a much stronger block at less cost. They also say that a great objection to most machines is that they are limited to making but a few sizes of stone. These disadvantages are overcome in the

Hercules Cement Stone Machine

It produces in addition to **Hollow Blocks, Water Table, Window Sills, Door Sills, Lintels, Coping, Curbing,** etc., up to 5 feet long by 24 inches wide (all on the one machine.)

IT IS A COMPLETE STONE PLANT IN ITSELF.

By the Hercules method, you tamp on the face, using a composition of two to one, one inch thick for the facing, and four to one or five to one of coarser material for the remainder of block. By this method you save cement and get a stronger stone.

Write us to-day for catalogue G. It will certainly interest you.

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runs through the great Portland Cement centre which extends across the counties of Warren and Hunterdon in the State of New Jersey, Lehigh and Northampton in the State of Pennsylvania, and Cayuga and Schuyler Counties in New York. There are also extensive deposits of marl at various points.

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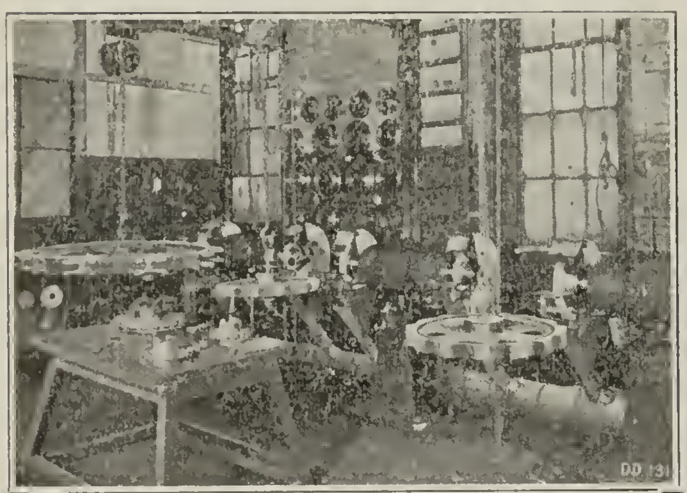

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the links of the chain should accurately fit the wheels on which they run. It is therefore our practice to carefully machine each sprocket wheel to fit a standard length of chain before sending it away from our works—a precaution increasing both the efficiency and the wear of the wheels.

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Mechanical and structural engineer, technical graduate, age 35, with experience in supervising designs and construction of buildings and machinery for cement plants, desires position as chief draughtsman or engineer. Address, "Cement Clinker," care of Cement & Engineering News.

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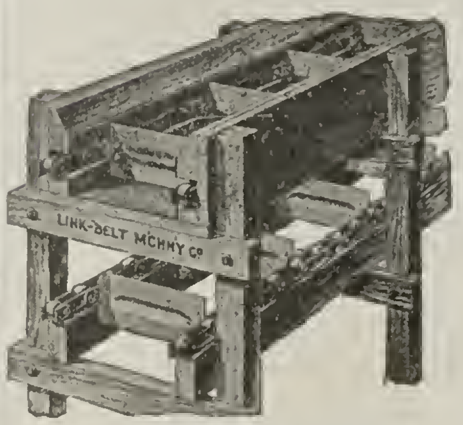

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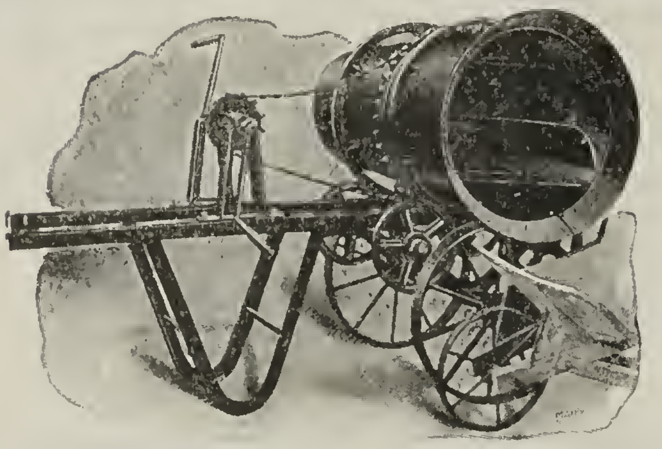

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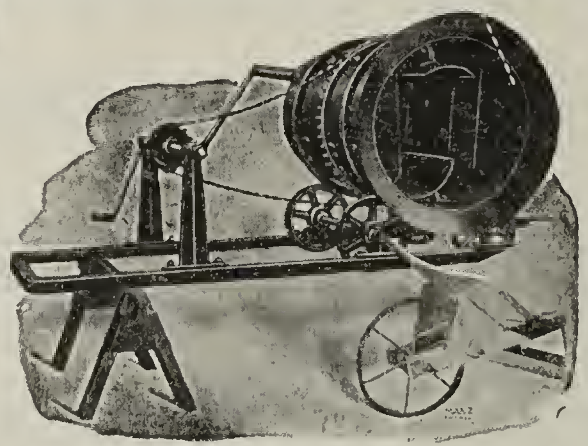

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ARCHITECTS' AND ENGINEERS' HANDBOOK OF
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172 Pages. Illustration and Diagrams 217 Pages.
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Position desired by chemist, experienced manufacturer of high grade Portland cement. Good results can be shown. Address, "Portland," care of Cement and Engineering News,
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TO DEMONSTRATE THE SUPERIORITY OF
Jeffrey Pulverizers
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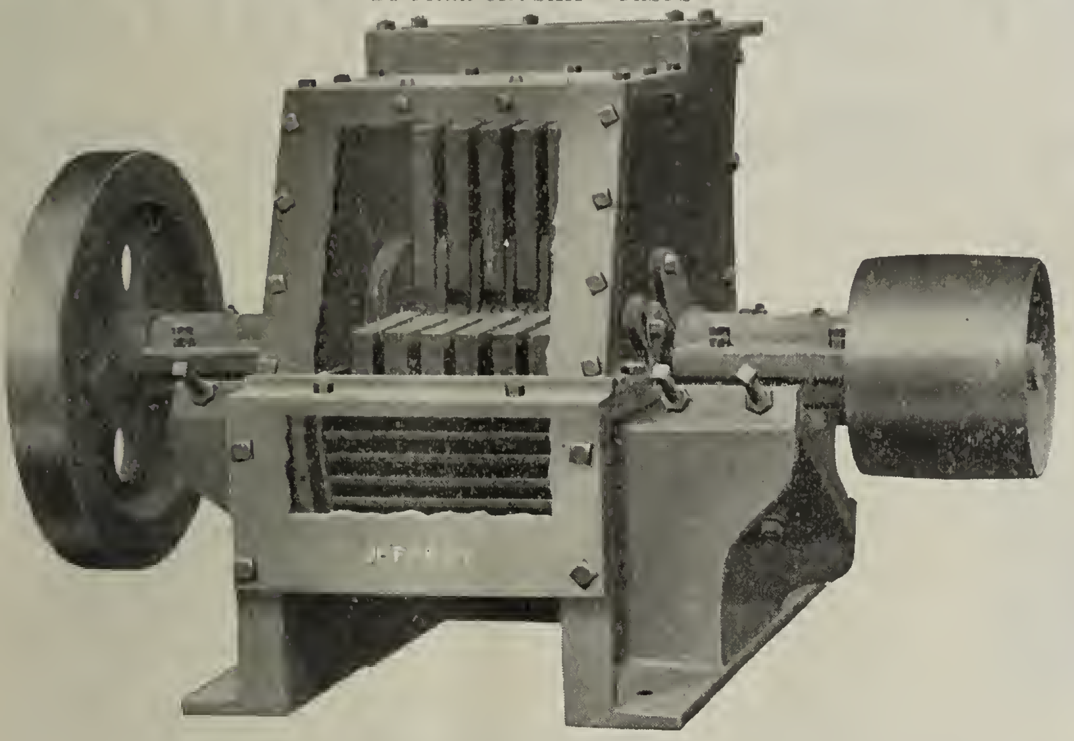

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Are Materials Treated. Catalogue 30 Contains List. Mailed Free.
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ELEVATING, CONVEYING POWER, TRANSMITTING MACHINERY.

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Quality unexcelled. The Recognized Standard American Brand. Always Uniform.
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Manufacturers of but one grade—strictly straight Portland.
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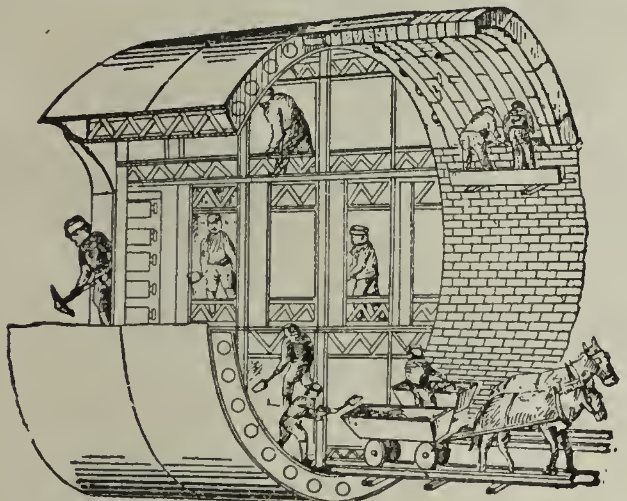

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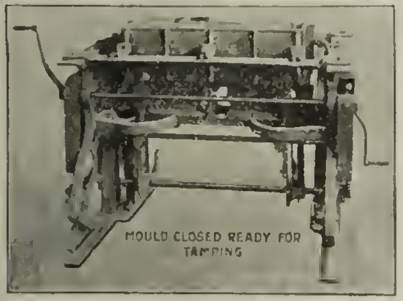
PATENTS GUARANTEED



ADJUSTABLE Makes Blocks any size or shape by simply changing plates AUTOMATIC
Porch Column Blocks 45° and 90° Angle Blocks
Circular Blocks 4 inch Partition Blocks (hollow)
FACING made easy and practical by means of tilting adjustment
FLUES clear bottom to top for ventilation, fire flues, piping or wiring
CAPACITY—150 Blocks (equals 6,000 bricks) in 10 hours — 4 men
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Chief Chemist over 4 years' experience, dseires to change present location. Best of references furnished. Can handle marl, clay, rock or shale, having had experience with all these materials. Address "Chief Chemist," care Cement and Engineering News, 162 LaSalle St., Chicago.

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Chemical and Mining Engineers.
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The Ideal Concrete Building Block Machine
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The most perfect machine on the market, forming face of block in bottom of the mould, making many designs, and every block perfect. Works automatically, no adjustment of bolts or hinges in changing designs, one man can make 125 blocks per day.

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Simplest, Cheapest and Most Expeditious Method of Constructing Hollow Concrete Walls. Descriptive Matter on Application. Address

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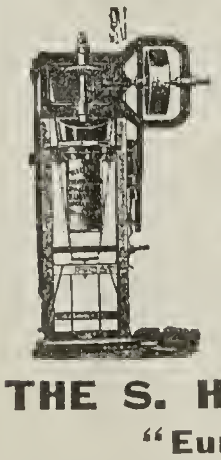

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AUTOMATIC FRICTION DRIVE
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STRONGEST, FASTEST AND MOST DURABLE FOR BARRELS.
MORE IN OPERATION THAN ALL OTHER MAKES COMBINED.
THE JEWEL IRON FRONT SACK PACKER.
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Established 1856.

You Build not for a Day but for 1,000 Years

By Using H. S. Palmer's Hollow Concrete Building Blocks

The Caldwell Residence, Springfield Ill.

Approved by engineers, architects and municipal corporations.—Absolutely water, fire, frost and vermin proof, giving ventilated walls, as well as conduits for water, gas and electricity and are positive non-conductors of heat and cold.

No cutting required. Produced by unskilled labor with the Palmer Hollow Block Machine at the rate of 300 to 400 cu. ft. per day.

A good business can easily be built up in every town, village and hamlet in the U. S., requiring only a moderate investment of capital.

Thousands of buildings of this construction have been erected, including warehouses, business blocks, factories and dwellings.

Wherever brick or stone are used for building purposes these blocks can successfully compete.

Machines and Territory for Sale.

Write for full information. Agents Wanted.

Harmon S. Palmer, Originator of the Hollow Concrete Block System

WANTED—We Want the Name of Every Party Selling, Buying or Using any HOLLOW CONCRETE BUILDING MACHINES, as well as the Location of every Building Erected with HOLLOW CONCRETE BLOCKS, Without Our License. For First Information We Will Pay a Reward. Address The Law Department of the Harmon S. Palmer Co., 1450 Binney St., Washington, D. C.

The United States Circuit Court for the Western District of Kentucky, at Owensboro, June 2, issued an injunction against Spayd and Bennett, restraining them from making or sell any machine or apparatus for making building blocks embodying or employing the inventions and improvements made and claimed by H. S. Palmer, in patents Nos. 375, 377, Dec. 27, 1887, 623, 686, April 25, 1899, 727, 427, May 5, 1903, and 727, 428, May 5, 1903.

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Portland Cement Plants Designed, Constructed and Superintended.

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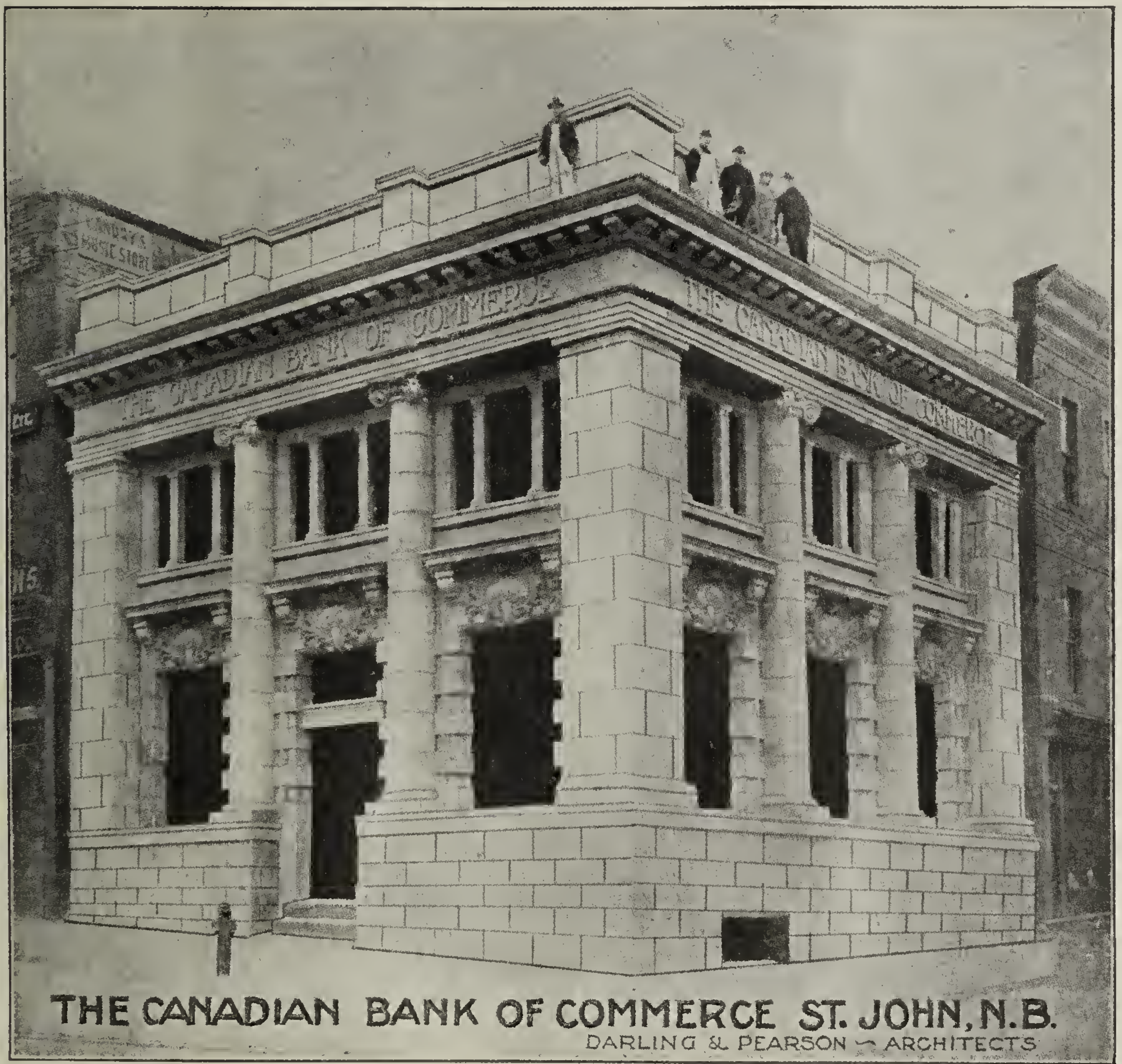
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CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
OFFICE—162 La Salle Street.
Cable Address—"Seafert," Chicago.

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This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, FEBRUARY, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE GROWTH OF THE CONCRETE BUILDING BLOCK INDUSTRY.

It is gratifying to note the rapid development of the Concrete Building Block industry in the United States. Some sixteen hundred plants are now in operation, all doing a thriving business in competition with the older materials of construction. One cause of this rapid growth is, that the heavy freight charges on brick, stone and lumber is reduced to a minimum in the cement block industry.

The Cement Block manufacturer simply pay freight on the cement, the other materials entering into the cement block are as a rule found in the vicinity, in the form of sand, gravel and crushed stone. These materials are subject to little or no freight charges and weigh from four to eight times as much as the cement; then again, there is no waste of the cement in the making of the block. Cement can therefore be laid down at the most distant points, whereas the older materials of construction would be prohibitive, simply on account of their dead weight.

Even where brick are locally manufactured the fuel used in burning them is costly.

The cement block, which displaces 28 common brick, can be laid by less skilled and lower priced labor. Again a much greater number of cubic feet per hour or day can be laid with hollow block than with brick. The block being hollow, saves material, at the same time produces a more desirable form of construction. The hollow spaces in the wall make the building warmer in winter and cooler in summer. The fireproofing properties of concrete is another claim which is appreciated by owners of buildings, insurance rates being reduced.

Notwithstanding the great strides the concrete block has made in the past it is still in its infancy. Where one building has been erected in these blocks in the past, there will be fifty in the near future. Now the block is looked upon as an innovation; a little more education will make it a standard method of construction throughout the land.

PURCHASE CEMENT NOW.

There is to be an advance of 10c per barrel on all cement sold for delivery after April 1st. Consumers should purchase now and call for deliveries before the rise is effective.

The cement block manufacturers should order enough cement to fill all orders for all work in sight.

Manufacturers of cement specialties in Europe always keep a stock of aged cement on hand, as experience has demonstrated that more reliable work can be assured by the use of seasoned cement. The cement block makers should for the same reason lay in enough cement to keep at least six weeks ahead and there will be less complaint on account of faulty work.

WATER PROOF PAINTS FOR CONCRETE.

Toch Bros. of New York have placed upon the market several different kinds of waterproof coatings for concrete work. These paints have come into extended use in Chicago with uniform success. The palaces of the emperors of Germany and Russia have been treated with these paints, as well as Westminster Abbey in London. The Garden City Sand Co. of Chicago, western agents, will furnish information on the subject as well as descriptive literature on application.

SLATE PENCILS.

In making slate pencils broken slate is put into a mortar run by steam and pounded into small particles. Then it goes into a mill and runs into a "bolting" machine, such as is used in flouring mills, where it is "bolted"; the fine, almost inpalpable flour that results being taken to a mixing tub, where a small quantity of steatite or talc flour being essentially a hydrated silica of magnesia, which, when pure, consists of silica 62.0, magnesia water 4.9 = 100, which is added, together with other materials, the whole being made into a stiff dough. This dough is thoroughly kneaded by passing it several times between iron rollers. Thence it is conveyed to a table, where it is made into "charges," or short cylinders, four or five inches thick and containing eight to twelve pounds each. Four of these are placed in a strong iron chamber or "retort" with a changeable nozzle, so as to regulate the size of the pencil, and subjected to tremendous hydraulic pressure, under which the composition is pushed through the nozzle in the shape of a long cord and passes over a sloping table set at right angles with the cords to give passage to a knife, which cuts them into lengths. They are then laid on boards to dry, and after a few hours are removed to sheets of corrugated zinc, the corrugation serving to prevent the pencil from warping during the process of baking, to which they are next subjected in a kiln, into which superheated steam is introduced in pipes, the temperature being regulated according to the requirements of the article exposed to its influence. From the kiln the articles go to the finishing room, where the ends are thrust for a second under rapidly revolving emery wheels, and withdrawn neatly and smoothly pointed. They are then packed in pasteboard boxes, each containing 100 pencils, and these boxes are in turn packed for shipment in wooden boxes containing 100 each, or 10,000 pencils in a shipping. Nearly all the work is done by boys.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	DECEMBER				TWELVE MONTHS ENDING DECEMBER			
	1903		1904		1903		1904	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom.	....	....	134,850	532	58,797,537	190,444	6,546,080	22,794
Belgium	2,667,400	7,892	3,085,097	10,442	295,030,423	893,327	157,747,214	494,822
France	1,227,485	5,183	1,845,300	7,686	5,946,272	25,051	13,964,892	49,202
Germany..........	18,663,163	70,429	50,247,838	181,208	550,965,742	1,863,637	234,175,611	794,538
All Other Europe.	....	....	4,409	8	10,966,107	30,575	3,015,044	10,273
British North Am.	....	....	5,300	336	1,768,274	8,516	231,775	1,516
Other Countries..	....	....	....	....	3,705,880	15,561	2,836,512	9,899
TOTAL	22,558,048	83,504	55,322,794	200,212	927,180,235	3,027,111	418,517,128	1,383,044
Domestic Exports of Cement, bbls.	17,173	27,722	105,931	131,822	285,463	433,984	774,940	1,104,086

There were 14,913,749 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in December, 1903, valued at $53,949 against 25,660,653 lbs., valued at $80,313 in December, 1904.

Imports of asphaltum or bitumen for December, 1903, were 13,341 tons, valued at $46,838; December, 1904, 12,576 tons, valued at $62,504. For twelve months ending December, 1903, 167,554 tons, valued at $514,051; for twelve months ending December, 1904, 119,575 tons, valued at $510,524.

TO THE EDITOR OF THE CEMENT & ENGINEERING NEWS, CHICAGO, ILL.

Dear Editor: There is considerable agitation of the subject of the excess of air entering the present rotary cement kiln. This subject, no doubt, is one which is very interesting to the cement manufacturer who is compelled to economize in minute details, for which the present low prices no doubt are responsible.

In a recent publication an attempt was made to show the large percentage of air passing through the kiln in excess to that theoretically required for combustion. An analysis of the kiln gases was given, in which the free oxygen amounted to very near 12 per cent, while the carbon monoxide was less than one-half of 1 per cent. The high percentage of free oxygen, however, indicates a very large percentage of air in excess, providing the sample of gas was taken direct from the mouth or intake of the kiln. If this sample was taken from the stack it is quite evident that the gases had been considerably diluted by the air which creeps in through the flue doors and the opening between the flue and the revolving kiln. It appears impossible to accurately determine the index or working condition of a rotary kiln by taking the gas samples from the stack and afterward approximating the amount of dilution which is apt to yield results of more or less uncertainty.

The writer has not yet found two kilns that yield a gas when drawn from the stack of exactly the same dilution, and therefore considers the proper place to sample the gas for determining the index of a kiln would be direct from the mouth or intake, where there is no possible chance for contamination.

The space for economy on this subject is perhaps not so great as has heretofore been expected. In order to show the dilution which takes place in the flue between the kiln and the stack the writer has sampled and analyzed the gas from a rotary cement kiln in the Lehigh Valley district, which yielded the following results:

Analysis No. 1.

Sample drawn from the stack five feet above flue.

CO_2	12.40%
O	10.00%
CO	0.00%
N, etc., by difference	77.60%

The above high percentage of free oxygen certainly confirms recent publications very closely, but this, however, does not convince any one that such was the index of the kiln, after knowing that the gas drawn from the stack was diluted with air which creeps in through the openings in the flue.

Analysis No. 2.

This sample was drawn from the stack after all openings in the flue were closed as tight as possible, with the exception of that space necessary between the kiln and the flue.

CO_2	14.20%
O	9.40%
CO	0.05%
N, etc., by difference	76.35%

The decrease in the percentage of free oxygen in analysis No. 2 brings about strong evidence to the fact that the index of the kiln was considerably better than that indicated by the previous analysis. In order to show the exact index of the kiln, a sample was drawn direct from the mouth or intake which yielded a gas of the following composition:

Analysis No. 3.

CO_2	29.30%
O	0.70%
CO	0.40%
N, etc., by difference	69.60%

The coal used as a fuel while these results were obtained gave by analysis 8.65 per cent of ash or clayey matter. Should this coal be replaced by one that yields from 10 per cent to 14 per cent of ash, which is at times the case when different grades of coal are used as a kiln fuel, the index of the kiln would immediately change, and would in this case take in large volumes of air in excess to that actually required for combustion. Great care should be exercised in securing a uniform grade of coal, so that the kilns could be set to remain at the nearest economical point.

Yours respectfully,
W. Elwood Snyder, Nazareth, Pa.

DIVINING RODS.

In England scientists and other people are eagerly discussing "water-finders" or "water diviners," and whether they have some mysterious power which enables them to locate water deep beneath the ground or whether they are humbugs. Major General E. H. Sartorius, retired, of the British army, has written in regard to certain experiences of his. Army officials had been endeavoring to locate adequate water sources on the Isle of Wight for garrison purposes. A professional water diviner had been engaged and a young engineer lieutenant detailed to look after him. The water diviner did his work and departed. General Sartorius had utterly refused to believe in the power, but one day, somewhat as a joke, the general consented to take the forked twig in his hands and to walk with it.

"Holding the fork ends loosely," he writes, "I started toward the fort. I had walked some distance, chaffing my young friend, the engineer, and was about to return the twig to him when suddenly it twisted itself loose in my fingers and stood up straight. I confess to an uncanny sort of feeling, the surprise was so great. At a suggestion from the engineer I looked down and there in the ground at my feet I saw a peg. 'That peg, sir,' said the lieutenant, 'was driven in by the water diviner to mark the spot where water might be found.'

"I learned from this experience the existence of a power or force which was not capable of explanation," General Sartorius continues. "Recently I have employed a water diviner to find water for me on a small property in the Surrey hills with the greatest success. The amount of water he promised has been exceeded and the prophesized depth at which it was to be found was exact. Oddly enough, the twig no longer worked with me unless the water diviner held my wrists, then it jerked up when over the ground which he stated held water. He explained the loss of power by the indifferent state of health I was in."

Prof. W. F. Barrett, F. R. S., says that the birthplace of the modern divining rod, whether used to locate minerals or water, was in the mining districts of Germany, probably the Harz mountains. Its first recorded use was in prospecting for mineral lodes. The first mention of the use of the modern rod was in the latter part of the fifteenth century. Books published in the sixteenth century have pictures of miners searching for mineral veins in a very business-like way by noting the dipping of a hazel or willow rod, the forked ends of which are held in the hands of an expert.

German miners brought the forked rod into England toward the end of the sixteenth century for the exploitation of the Cornish mines. Prof. Barrett points out that the drooping character of the willow was probably believed to have something to do with the minerals concealed in the ground and that "it was but natural to cut a light branch from one of the trees and to see if it drooped in prospecting for ores." Thus the "dowsing rod" came into universal use among the miners of Europe, although it was soon believed that only certain persons had the gift of using the rod.

The business men of Yankton, S. Dakota, are discussing a project to erect a concrete auditorium, in which the regular fall festivals are to be held, in which will be exhibited agricultural and manufactured products produced in the vicinity, all to promote the business interests of Yankton. A committee was appointed to consult with architects on plans and cost of a structure that would seat not less than 3,000 people.

EDITOR CEMENT AND ENGINEERING NEWS.

Dear Sir:—

There is a strong inclination for cement contractors to use sand containing sufficient mud and loam to color the water used in gaging the cement, simply because such materials are easiest to obtain. Some of this sand contains a large percentage of loam and other sands carry clay in lumps and otherwise. Both kinds are often used in the making of cement building blocks. Would like to know the difference in strength between the sand having loam clay and pure sharp washed flint sand, in which the grains run from coarse to the finest. When made up into concrete building blocks with the proper amount of cement, will the addition of a greater amount of cement to the impure materials produce equally good work as the sharp clean sand?

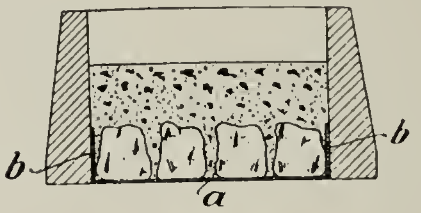
Ans.: Loamy sand will not produce good work, even if the loam is drowned with an abundance of neat cement. While from 6 to 12 per cent of clay thoroughly dissolved will not injure the strength of concrete, yet it may discolor the work slightly; therefore, the clay should not exceed 6 per cent. Numerous tests made by competent authorities show that the addition of clay produces stronger work than clean washed sand. Yet we believe that a clean washed sand containing large and small grains that will pack so as to produce the most dense mixture before the cement is added will yield the best results. Crushed granite will produce equally good results. The only objection to the use of crushed granite is its high cost compared with sand and gravel.

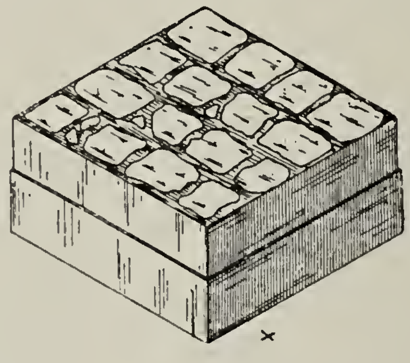
Ques.: Give a simple method of washing sand.

Ans.: Where water is available having a fall of a few feet, sand may be washed by the use of a wooden trough with holes in the bottom at intervals, through which the sand will fall by gravity, while the impurities will be carried off at the end of the trough. Construct a board trough 12 inches or more wide, with sides not less than six inches high. Bore five rows of 1 inch holes in the bottom of the trough. The holes should be staggered and six to eight feet from the upper end. Repeat the holes ten feet further down and again twenty feet down. Mount the trough on saw-horses, with a sufficient fall to move the sand by the force of a stream of water. Shovel the sand in at the upper end of the trough. There must be always sufficient water in the trough to permit the loam and clay to float, the sand being comparatively heavy it will fall through the holes and separate into piles of almost uniform size. This device will not only wash the sand but will distribute in piles or heaps. Where the sand is covered with sticky impurities the trough must be longer. It is sometimes well to nail a 1 inch strip just below each row of holes to arrest the gravel and cause it to settle and fall through the holes. These strips will cause ripples in the current and thus more effectually cleanse the sand and gravel from impurities. Where large quantities of sand are to be washed the dimensions of the trough as well as the water supply, must be increased. Blue prints for the apparatus will be furnished at $1 each.

COMPOSITE STREET PAVING BLOCK.

We illustrate a new form of street paving block, the invention of Bernhard Löhr, of Frankfurt, Germany. It consists of 16 paving stones bound together by Portland cement mortar. The upper cut shows the manner in which the block is formed; "a" is a metal form bent up on four sides as indicated by "b b"; this forms the bottom of the mould. Sixteen paving stones are next set into the form and a cement mortar poured over the stone and tamped. When a sufficient thickness of concrete is in place it is leveled off and permitted to harden. After the forms have been removed the block will have the form shown in the lower cut. The upper portion of the block will be slightly smaller by the thickness of the metal form than the lower portion of the block. When these blocks are set in the street there will be an open space between each two adjoining blocks.





SUNDAY FREIGHT TRAINS IN GEORGIA.

The Supreme Court of Georgia has handed down a decision, affirming the judgment of the lower court, which prohibits the running of ordinary freight trains on Sunday, the Court holding that only perishable goods trains can be operated on Sunday under the laws of Georgia.

NEW CEMENT BUILDING BLOCK FACTORIES.

Georgia.

John E. Du Bignon, Brunswick.

Illinois.

M. O. Smith & Co., Gibson City.
C. H. Carter, Meford.
Clough Bros., Quincy.
Harvard Cement Bldg. Block Co., Harvard.
Concrete Stone & Construction Co., Edwardsville.
Hindman Construction Co., Johnson City.
T. B. Wright and Asa Wood, Mt. Carmel.
E. S. Kennedy, Saunemin.

Indiana.

Peter Baumgardner, Linn Grove.
S. E. Kessler, Columbia City.

Iowa.

C. M. Hilliker & Son, Akron.
Iowa Building Block Machine Co., Waterloo.
Oskaloosa Cement Block Co., Oskaloosa.
E. H. Samuelson, Boone.

Kansas.

O'Neil, Torbett & Phillipp, Atchison.
Geo. Harris, Paola.
Frank Moores & Son, Seneca.
Brewer & Fulton, Seldon.
McGregor & Walters, Manhattan.

Michigan.

Wells & Miller, Vassar.

Minnesota.

Mankato Sidewalk Co., Mankato.
Nelson & Swenson, Willmar.

Missouri.

Helm Machinery Co., Kansas City.

Nebraska.

Will Wheeler, Atkinson.
Phelps Concrete Co., Wahoo.

New York.

R. A. S. Bloomer, Newark.

Ohio.

S. A. Buchanan, Bellefontaine.
I. S. Meyers, Wadsworth.
Geo. Plaine, Chardon.
J. J. Hawk and J. Discus, Findlay.
Lake Erie Cement & Construction Co., Milan.
Morse Bros., Middlefield.
The Cement Block & Supply Co., Marietta.

Pennsylvania.

Shamokin Cement Bldg. Blk. Co., Shamokin.
Henry E. Craley, Red Lion.

Wisconsin.

Koch & Geiger, Brillion.

West Virginia.

Irvin A. Jackson, Clarksburg.

IOWA CEMENT-USERS CONVENTION.

A convention of the cement users of Iowa has been called at Ames, Iowa, March 1 and 2. The convention will meet in the Engineering Hall of the Iowa State College.

The following is a partial list of papers to be read and discussed:

"The One-Piece Building Block," by O. U. Miracle, Minneapolis.

"Coloring of Cements," by J. P. Sherer, Milwaukee.

"Curing of Cement Building Blocks," by James Wimmer, Perry.

"Ornamental Cement Work," by W. D. Faus, Webster City.

"Concrete Mixing," by T. L. Smith, Milwaukee.

"The Field in Iowa for the Cement Block Industry," by Professor S. W. Beyer, Ames.

"Cost of Making and Prices Charged for Building Blocks, Sidewalks, etc.," by L. L. Bingham, Estherville.

There will also be many other papers.

An extensive exhibit of machinery for the manufacture of concrete will be a special feature of the convention, as well as various brands of Portland cement will be displayed. All persons engaged in the use of cement and the manufacture of cement products machinery are urgently requested to be present.

An entertainment committee will meet all trains and suitable accommodations will be provided for all. Those intending to be present should notify I. A. Williams, Ames, Iowa, in order that they may be properly provided for.

TROUBLE WITH SAND.

A German cement ware manufacturer relates his experience with what appeared to be a clean sharp sand, which would not show even a fair product. At first the trouble was laid to the cement. Complaints were made to the cement manufacturer. Samples of the sand were sent to the works to be worked up into test pieces. The results were uniformly bad. Other samples were sent to the laboratory of the Tonindustrie Zeitung, Berlin, where it was found that the sand was covered with a film of paraffin, which caused all of the trouble. The sand was mined from under a brown coal deposit, from which the paraffin had filtered into the sand.

BELGIUM'S CEMENT EXPORTS

Belgium is taking front rank in European cement exporting nations. Last year she sent abroad nearly 600,000 tons, or nearly 3,000,000 barrels, coming to the front as one of the largest, if not the largest, of European exporting nations.

GLUE OR GELATINE MOLDS.

The elastic glue or gelatine moulds used in casting ornamental under-cut cement ware and statuary are made as follows:

Place in a doubled bottom water jacket kettle 10 pounds good glue, cover with 5 quarts of rain or other pure water. Set the kettle away for 24 hours to permit the glue to swell and soften, after which pour off the surplus water and heat over a water bath or double bottom kettle until it attains a uniform consistency. Then add six pounds raw glycerine and one ounce salicylic acid; stir while the last two ingredients are being added, so as to produce a thorough compound. Strain hot through a linen cloth. After the compound has been permitted to settle and free from scum or foam it may be used to form the moulds.

The positive form from which the moulds or negative form is to be taken is usually placed in a box or clay housing and the glue composition poured in a thin stream, rather slow, around the positive form to be reproduced. The more intricate and undercut the form to be reproduced the slower will the composition have to be poured, in order to do away with air holes in the gelatine forms.

Four to five per cent tannin added to the compound will make the mould more durable and water proof, or a light coat of shellack may be laid on the inside of the mould with a camel's hair brush for waterproofing. After the mould begins to show defects the composition may be melted down and new moulds cast over and over again. The original model from which casts are to be taken should be lightly brushed over with rape seed oil, to prevent adhesion in removing negative form.

TO MAKE A COMPASS OF YOUR WATCH.

Get the number of hours from midnight, divide by two, and point the hour at the sun so that the shadow of a match or lead pencil falls directly across the center of the watch; 12 o'clock will be north, 6 south, 9 west, and 3 east. Suppose it is 9 a. m.; number of hours from midnight is 9; one-half is 4½; point 4:30 at the sun so the shadow of a match or lead pencil falls across the center of watch, and 12 is north, 6 south, 3 east and 9 west. Suppose it is 6 p. m.; number of hours from midnight 18; one-half, 9; point 9 at sun and 12 is north, 6 south, 3 east and 9 west.

VIENNA LIME.

Vienna lime is simply dry slacked lime, and is used in polishing electro plate work.

The raw material from which it is made must be of the greatest purity. All particles that do not fall to an impalpable powder must be rejected. Above all it must be free from sand. The lime must be well burned, otherwise it will not reduce to the impalpable powder which is absolutely essential in the slaking. It is very fluffy and weighs less than 75 pounds to the barrel and is in considerable demand.

H. S. Palmer's licensees are respectfully requested to report such damages as they may have sustained by reason of infringers or derogatory statements regarding the H. S. Palmer patents to this office without delay.—Harmon S. Palmer Hollow Concrete Building Block Co., Washington, D. C.

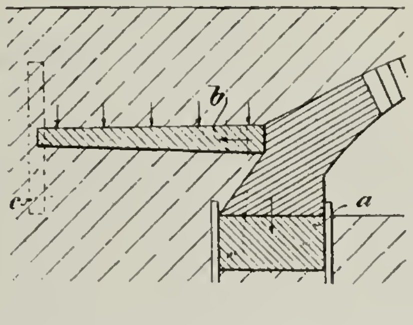
HIGHEST AWARD.

The Rickelson Mineral Paint Works, of Milwaukee, Wis., received the highest reward on Mortar Colors at The Louisiana Purchase Exposition at St. Louis. Their colors never fade, and we cheerfully recommend them for coloring cement work and mortar joints for brick laying.

WILL INCREASE CAPACITY OF PLANT.

At the annual meeting of the Alpena Portland Cement Co., P. Culligan was elected president, C. H. Reynolds vice president, and John Monaghan secretary. W. S. Russell of Detroit is one of the new directors. During the past year 200,000 barrels of cement were sold.

A German patent, for strengthening the haunches of an arch, has been granted to Max Möller of Braunsehweig, Germany. It consists of a horizontal plate "b," one end of which bears against the arch and the other end bearing against a perpendicular wall "c," all as illustrated. By this form of construction the masonry can be made much less massive.



Auburndale, Ohio.—The American Conduit Company, recently organized with a capital stock of $500,000, will have its headquarters in Toledo and proposes the erection of a $20,000 plant for the manufacture of cement conduits and allied outputs.

KOSMOS PORTLAND CEMENT CO.

The plant of the Kosmos Portland Cement Company, located at Kosmosdale, about seventeen miles southwest of Louisville, Kentucky, on the Illinois Central Railroad, and on the banks of the Ohio river, has been under construction since June 3, 1904, and is now within a few weeks of completion. The plant as designed by Professor R. C. Carpenter, of Cornell University, and Mr. W. H. Baker has a capacity of 2,500 barrels a day. For the first year, however, only sufficient machinery has been installed for half of this output. It is expected the full capacity will be attained by the spring of 1906.

The raw materials are limestone and clay of excellent quality. The plant is built on the clay land which, in the whole tract of 800 acres owned by the company, shows a remarkable uniformity of composition. The limestone quarry is about 28 miles from the plant on the Ohio river and rises precipitately for 300 feet from the edge of the river. It is of great purity and softness and, although distant from the works, the cost of bringing the rock to the mill is no greater than if it were in close proximity, owing to the low cost of river transportation.

The preliminary crushing is done at the quarry where the limestone is caught in conveyors as it comes from the crusher and is dropped in bins discharging into chutes, which convey the rock to barges in the river. At the plant, the barges are emptied by clam shell and orange peel buckets operated by a five-ton derrick. This drops the rock in small cars of 80 cubic feet which carry the rock some 800 feet to the stone storage building and which are operated on a cable way. Pittsburg coal is also brought to the plant by the river and is unloaded in the same manner.

As there is no top soil on the clay, it is easily gathered by wheel scrapers and conveyed in cars by another cable-way to the clay storage. The raw materials are now carried through the series of buildings emerging from the Griffiin Mills as finished cement. These buildings have been constructed in a most substantial manner, as has everything about this plant. Every building is of structural steel, walled in with cement mortar on expanded metal, and, although utility and adaptability for the manufacture of cement were alone considered in the construction, the result is very pleasing to the eye, and, in addition, the structures are as near fireproof as it is possible to construct them. From the rock storage, the limestone passes through driers 60 feet long by 6 feet in diameter and is carried by a belt conveyor to bins over Ball Mills, which are placed with the Tube Mills in a separate building.

After being reduced to a very small size, another belt conveyor carries the stone to the mixing building and drops it in the bins there.

The clay, after passing through driers (60'x6') is carried to the clay bins in this same mixing building. At this point, careful analysis of the clay and limestone are made and the proper mixture, as determined by an expert chemist, is made. A special device is here used which, by mixing them in small quantities, insures a thorough physical mixture of the two materials. The limestone and clay thus carefully mixed, enter the Tube Mills, where they are ground together to such a fineness that less than 15 per cent is left on a No. 200 sieve (40,000 meshes to the square inch).

The coal, after being dried and finely pulverized, in the same manner as the limestone, is brought to the kilns from the Coal Building which is some distance from the rest of the plant.

The Kiln Building presents a somewhat different appearance from that generally seen in Portland cement plants. The arrangement for using the waste gases from the kiln, as designed by Prof. R. C. Carpenter and successfully operated in several mills built by him, is used. The boiler room, therefore, becomes a part of the Kiln Building, and each kiln and boiler forms a unit.

The boilers are placed at the take-in end of the 80-foot kilns in this order: a boiler, two kilns, two boilers, two kilns, one boiler, etc. The heated gases from the kilns pass through these vertical tubular boilers and thence through an economizer and into the air, aided by an induced draft fan, the stacks being placed toward the discharge end of the kilns and between them.

The clinker coming from the kiln

Kosmos Portland Cement Works, Located at Kosmosdale, Ky.

is cooled and then is conveyed to the clinker storage. The clinker is allowed to ripen during several weeks in this building, which is constructed without walls to permit a free circulation of air. This storage of the clinker is now recognized as an important factor in producing a Portland cement of constant composition and of the highest grade. The clinker is ground to finished cement in Griffin mills, placed in a building by themselves. A large stock house, a carpenter shop, a machine shop and office and laboratory building complete the list of buildings, with the exception of the power house. This is located directly between the raw grinding building and the clinker building. Two Cooper Corliss tandem engines, run condensing, 550 H. P. and 450 H. P. respectively, and directly connected with the grinding mills by the engine shafts, are used, thus reducing the loss in transmission of power to a minimum. These two engines are the heaviest ever built for their respective horse powers and are well adapted to the hard service of a cement plant. All other machinery is driven electrically, the electric power being generated by two 300 H. P. steam turbines, in connection with which super-heated steam is used.

The three phase, 7,200 alternations, 440 volts system is the one used throughout in conjunction with induction motors. Adjacent to the plant is a large natural pond into which water is pumped from the Ohio river; as the water supply is unlimited, the condensing system is advantageously used. The draining and sewage system is very complete, not only for the plant but for houses built by the company for its employes. About 35 houses, built of concrete, are already occupied. Some larger houses, also of concrete, have been built for the superintendent and other skilled employes. These houses are also lighted with electricity. The comfort of the men about the plant has been considered and, among other things, shower baths have been installed; an arrangement much appreciated by anyone who has worked in a cement mill. A new station, to be built of concrete, is about to be erected. This station will be called Kosmosdale and is located close to the plant. It supercedes the old station near there known as Riverside.

The company with ample capital at its disposal has striven to use only the best of everything in the construction of this plant, and, although it has not used any machinery or device that has not proven itself efficient, it believes its plant to be the best equipped and most up-to-date in the country.

Booklets will be sent to those interested on application. The address of the company will be found in its advertisement on another page of this issue.

STANDARD SPECIFICATION FOR PORTLAND CEMENT.

The specification just issued by the Engineering Standards Committee on Portland Cement provides that the cement shall be prepared by intimately mixing together calcareous and argillaceous materials, burning them at a clinkering temperature and grinding the resulting clinker. No addition of any material is to be made after burning, except when desired by the manufacturer, and if not prohibited in writing by the consumer, in which case calcium sulphate or water may be used. The cement, if watered, must contain not more than 2 per cent of water, whether that water has been added or has been naturally absorbed from the air. If calcium sulphate is used, not more than 2 per cent, calculated as anhydrous calcium sulphate, of the weight of the cement is to be added.

DIMENSIONS OF BRIQUETTE.

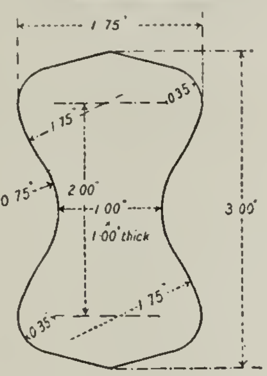


Fig. A

DETAILS OF JAWS FOR HOLDING BRIQUETTE.

PLAN

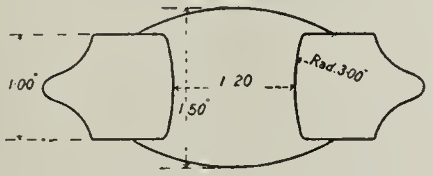
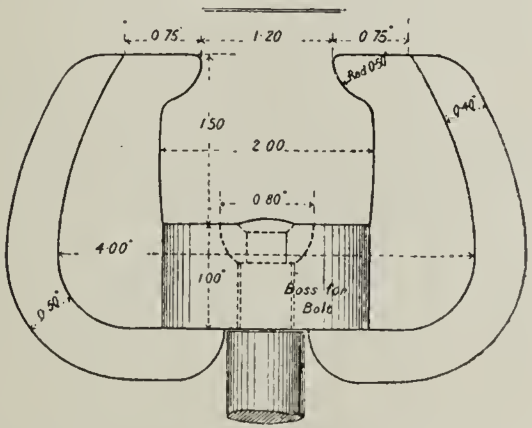


Fig. B.

ELEVATION.



The cement is to be ground to comply with the following degrees of fineness, viz.:

The residue on a sieve 76 by 76 = 5,776 meshes per square inch, shall not exceed 3 per cent.

The residue on a sieve 180 by 180 = 32,400 meshes per square inch shall not exceed 22½ per cent.

The sieves are to be prepared from standard wire, and the size of the wire for the 5,776 mesh shall be .0044 inch, and for the 32,400 mesh, .002 inch. The wire must be woven (not twilled), the cloth being carefully mounted on the frames without distortion.

The specific gravity of the cement is to be not less than 3.15, when sampled and hermetically sealed at the manufacturer's works, nor less than 3.10 if sampled after delivery to the consumer.

The cement must comply with the following condition as to its chemical composition: There shall be no excess of lime, that is to say, the proportion of lime shall not be greater than is necessary to saturate the silica and alumina present.* The percentage of insoluble residue shall not exceed 1.5 per cent; that of magnesia shall not exceed 3 per cent; and that of sulphuric anhydride shall not exceed 2.5 per cent.

The cement after being gauged, is to be filled without mechanical ramming into moulds of the form shown in Fig. A, plate 1, each mould resting upon an iron plate until the cement has set.

Briquettes of neat cement of the shape shown in Fig. A are to be gauged for breaking at 7 and 28 days respectively, six briquettes for each period. The average tensile strength of the six briquettes shall be taken as the accepted tensile strength for each period. For breaking, the briquette must be held in strong metal jaws, of the shape shown in Fig. B., the briquettes being slightly greased where gripped by the jaws. The load must then be steadily and uniformly applied, starting from zero, increasing at the rate of 100 lb. in 12 seconds. The briquettes are to bear on the average not less than the following tensile stresses before breaking:

Seven days from gauging, 400 lb. per square inch of section; 28 days from gauging, 500 lb. per square inch of section. The increase from 7 to 28 days shall not be less than:

25 per cent when the 7 day test falls between 400 lb. to 450 lbs. per square inch of section; 20 per cent when the 7 day test falls between 450 lb. to 500 lb. per square inch of section; 15 per cent when the 7 day test falls between 500 lb. to 550 lb. per square inch of section; 10 per cent when the 7 day test is 550 lb. per square inch or upwards.

The Cement Products Co. of Birmingham, Ala. F. H. Mathews, president; O. S. Heller, vice president; E. F. Hopton, secretary and treasurer. The company will manufacture cement building blocks under the American Hydraulic Stone Co. patents.

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*The proportion of lime to silica and alumina shall be not greater than the ratio represented by $\frac{CaO}{SiO_2+Al_2O}=2.75$.

INCORPORATED.

Southern Ferro-Concrete Co., Atlanta, Ga.; capital $30,000. W. H. Harrison and F. Berne, incorporators.

Concrete Construction Company, Portland, Ore.; capital stock $10,000. Elwood Wiles, Grace M. Wiles and Hubert C. Humphreys, incorporators.

Clarion Concrete Construction Company of Clarion, Ia.; capital $10,000; incorporators, George Schumacker, F. A. Partee and G. C. Elder.

Clough Concrete Construction Company, Quincy, Mich.; capital $8,000; manufacturing cement; incorporators, J. G. Clough, E. S. Clough, W. D. Clough.

The Lake Erie Cement and Construction Co., Norwalk, Ohio; W. T. Hood, J. W. Chesround, J. F. Hufford, C. A. Peach, W. H. Oden; capital $50,000.

Artificial Stone Co., Jackson, Mich.; capital stock $5,000. Stockholders, W. T. Smith, A. M. Haight, Perry Merrill and W. C. Miller. Objects, to manufacture concrete and cement building blocks.

The American Keene Cement and Lime Co., New York City, to manufacture cement and lime; capital $350,000. Incorporators: Max Hermann, S. H. Hermann, J. J. Silver, all of New York.

The United Concrete Machinery Company, Portland, Me., is incorporated; capital $2,000,000. President, L. L. Hight, Portland; Buxton Smith, Portland; H. C. Wilbur, Portland.

Randolph Concrete Building Block & Sidewalk Co., Randolph, Wis.; capital stock $6,000. Objects, to manufacture artificial stone. Incorporators, W. R. Owen, E. W. Brandel, Chas. Auspach, H. H. Williams, J. W. Deniger and G. H. Klatt.

Penn Concrete Co., Philadelphia, Pa.; capital stock $50,000. Objects, to manufacture, buy, sell and deal in hollow cement blocks for building purpose.

New Era Cement Roofing Co., Nashville, Tenn.; capital stock $10,000. Objects, to manufacture material for roofing buildings. Incorporators, George Benedict, C. T. Benedict, H. Hardison, W. T. Hardison, Jr., and Joseph W. Byrus.

Guthrie — Cement Plant. — Incorporated: The Kansas City Portland Cement Co., with $350,000 capital, by James A. O'Shee, Patrick L. O'Shee, Michael Cassidy of Guthrie, W. H. Caffrey, George W. Evans, R. R. Miner, G. W. Williamson, T. W. Miller and F. C. Vincent of Kansas City, Mo.

Dolese & Shepard Company, Chicago; to deal in stone, brick, lime, cement and other materials; capital $500,000, of which $50,000 is represented by property located in Wisconsin; W. E. Philips, treasurer.

The Americus Tile & Artificial Stone Co. of Americus, Ga., to manufacture Portland cement building block, ornamental stone, re-enforced concrete structures. The company will be in the market for machinery to equip their plant. Address O. P. Wallis, Americus, Ga.

Schelde-Chapman-Christenson, St. Paul, Minn.; capital stock $50,000. Objects, general contracting and manufacture of artificial stone. Jeff Schlede, Litchfield; L. H. Chapman, St. Paul, and Sam Christenson, Wahpeton, N. D., are the incorporators.

MacDonnell Brick and Cement Company of Jacksonville, Tenn., with a capital stock of $20,000, for the purpose of manufacturing brick, lime, cement and all kinds of earthenware. The incorporators are: A. H. West, W. P. Brubaker and G. W. Canfield, all of Jacksonville.

LaFayette Gravel and Concrete Company, LaFayette, Ind.; capital stock, $50,000; incorporators, Charles F. Hunt, Willard Robertson and Clinton R. Flynn; purpose, to make concrete and build roadways, works of art, etc.

The Kansas City Portland Cement Company of Guthrie, with $350,000 capital stock; the incorporators are: W. H. Caffrey, George W. Evans, R. R. Miner, G. W. Williamson, T. W. Miller and F. C. Vincent, of Kansas City; James A. and Patrick L. O'Shea and Michael Cassidy of Guthrie.

Granite Sidewalk Company, Milwaukee, Wis.; purpose, to construct cement sidewalks, etc.; incorporators are Anton J. Zielinski, Casimir Klos and John Maciolek; capital stock $2,000.

NOTES.

The Omega Portland Cement Co. declared a 4 per cent dividend for 1904 and paid off $20,000 indebtedness.

Peerless Portland Cement Co., election of officers: President, A. W. Wright, Alma; vice president, S. O. Bush, Battle Creek; secretary and treasurer, W. M. Hatch, Union City; general manager, J. R. Patterson, Union City; assistant manager and chemist, A. Lundteigen, Union City. All of Michigan.

The Peerless Portland Cement Co. output for 1904 exceeded 300,000 barrels.

The Wyandotte Portland Cement Co. at Wyandotte, Mich, shut down late in January for repairs. Messrs. Beal & Banks of the chemical department are spending their vacation at Fenton.

Officers of the new United States Portland Cement Co., are: President, E. W. Shirk; vice president, E. I. Fisher; treasurer and general manager, A. Lehman; secretary, F. M. Talbot. The company was formerly known as the Midland Portland Cement Company of Bedford, Ind.

The Wolverine Portland Cement Co. plant at Quincy, Mich, shut down in January after a continuous run since May, 1904. This is the longest run the plant has made.

The Portland Cement Co. of Utah manufactured 90,000 barrels of cement in 1904, of which 45,000 barrels were used in Salt Lake City. The company plant is under the management of Ledyard M. Bailey. The cement is giving the best satisfaction.

The Ironton Portland Cement Co. at its annual meeting elected the directors: S. B. Stece, H. A. Marting, F. C. Tomlinson, S. G. Gilfillan, J. W. Slater, W. P. Lewis, F. L. McCauley, J. H. Lucas and Leo Ebert. A five per cent annual dividend was declared.

At a meeting of the stockholders of the Egyptian Cement Company the following officers were chosen: President, Robert J. Whaley; secretary and treasurer, Edgar D. Kennedy; board of directors, Messrs. Theodore G. Wolfe and Charles D. Sanderson, of Scranton, Pa.; J. Fletcher Williams, Clarence Tinker, C. B. Shotwell, G. W. Hubbard, D. S. Frackelton, W. S. Rundell and C. L. Bussey. The managing committee for the present is made up of Messrs. J. Fletcher Williams, Geo. W. Hubbard, Robert J. Whaley, Clarence Tinker and Edgar D. Kennedy.

The Diamond Portland Cement Co. of Middlebranch, O., has had an agent in the field extending its oil and gas land lease. 2,000 acres have been leased northwest of Louisville, Stark Co., Ohio. The company has been using natural gas fuel in part of its kilns for some years. Mr. J. M. Bergold of Canton, O., is the company's agent in securing oil and gas land leases.

M. T. Roche, northwestern sales agent of the Alpena Portland Cement Co. has closed an order for 100,000 barrels of cement for his company to be used in the construction of the Koochiching Power Co.'s plant and dam at International Falls, Itasca Co., Minn. This is said to be the largest single order for Portland cement ever given in the northwest.

Peninsular Portland Cement Co., election of officers: President and general manager, W. F. Cowham; vice president, W. H. Niblick, Decatur, Ind.; secretary, J. W. Shove, Jackson, Mich.; treasurer, N. S. Potter, Jackson, Mich.; directors, W. F. Cowham, N. S. Potter, Jackson; C. A. Newcomb, Jr., Detroit; M. B. Sweeting, Jackson; W. G. Anderson, Detroit; Jacob Foerster, Ypsilanti; F. E. Palmer, Jackson; D. C. Griffin, Ypsilanti; J. W. Shove, Jackson; W. H. Niblick, Decatur; W. W. Hawley, Huntington, Ind.

At its annual meeting the Southern States Portland Cement Co., Rockmart, Ga., elected the following officers: P. J. Flournoy, president; H. F. VanDeventer, secretary and treasurer; Robert Burnett, T. J. Lamb, Horace VanDeventer, Mr. Day, Mr. McLaren, Mr. Snider, Mr. McBurney and Mr. Clouston directors. The cement plant is doing a very large business.

At the annual meeting of the El Cajon Portland Cement Co. stockholders recently held at Detroit directors were elected as follows: Selig Solomon, Geo. B. Loud, R. A. Richards, H. K. Loud, F. H. Loud, W. E. Rogers, Jonathan Palmer, J. M. Parker, Emery E. Perrin. The officers chosen are: President, Geo. B. Loud; vice presidents, R. A. Richards and Selig Solomon; secretary and treasurer, H. K. Loud. The plant will be completed during the coming year.

The Egyptian Portland Cement Co. is to increase the capacity of its plant up to 1,100 barrels per day. $25,000 working capital has been pledged. The creditors of the company have agreed to extend the time of payment of their claims to Jan. 1, 1906.

The Wisconsin Cement Co., of Portage, Wis., has been incorporated under the laws of Wisconsin. Capital stock $750,000, in shares of $100 each. The plant is to be located at Lake Ennis, Wis. The Wisconsin Central Ry. engineers have just completed a survey from its main line at Portage to Lake Ennis, for a branch line which is to be constructed and when completed work on the cement plant will begin. The building site being on the farm of John Muir. The company's main lands are in Marquette and Columbia counties near the towns of Portage and Marquette, Wis. The officers of the company are: S. T. Meservey, president; S. M. Babcock, vice president; F. H. Merrell, secretary; Joseph Hainsworth, treasurer. The board of directors is S. T. Meservey, chairman, S. M. Babcock, Joseph M. Boyd, Joseph Hainsworth and F. H. Merrell.

The Portland Cement Co. of Colorado works, six miles east of Florence, which was closed down for repairs on Jan. 1, resumed operations. The company has decided to install electric drills and a steam shovel to facilitate the work of quarrying shale, which will mean a saving to the company of $15,000 annually.

The Washington Portland Cement Co. has been organized to erect a cement plant near Burlington, Skagit County, Washington, a new town is to be located. It is to be called "Cement." $200,000 capital stock has been subscribed. The Great Northern Ry. has agreed to put in sidetracks. The buildings are to be timber framing, covered with corrugated iron, and subsequently covered with concrete. The company is incorporated under the laws of Washington, with H. N. Anderson president; A. S. Austin vice president, W. W. Butler, secretary; I. M. Anderson, treasurer, and E. C. Miller, general manager, all of Aberdeen, Chehalis County, State of Washington.

The Elk Rapids Portland Cement Co. will receive ten cars of lime rock per day over the Pere Marquette Ry. The rock will be used in the manufacture of Portland cement.

The Buckhorn Portland Cement Co., at Rowlesbury, W. Va., will rebuild their factory, which was burned in December last.

The Aetna Portland Cement Co. has let contracts for the construction of four scows to be used for conveying mail to the works.

Calgary, Alberta, Canada.—It is reported on excellent authority that Sir Sanford Fleming has decided to establish an elaborate cement plant at Kananaskis Falls and that an expert has been in Calgary investigating the proposition for some time and is now satisfied that the enterprise is economically feasible. A fine deposit of cement of unlimited quantity has been located near the scene of the proposed industry and everything looks favorable to the plan.—Winnipeg Free Press.

The Wabash Portland Cement Co., which closed down January 4th, is now undergoing repairs. The plant is to open up March 1st with a force of 125 men.

J. A. Cruikshanks of Bellefontaine, Ohio, and C. F. Ritter of Covington, Ky., have purchased a site for a cement plant to be known as the Louisiana Portland Cement Co., at the mouth of Lake Borgne Canal. Oyster shells from various canning factories on Lake Borgne will be used for the lime content in the cement. The American Portland Cement Co. of Neodesha, Kan., is said to be identified in the project.

The White Portland Cement Company's new plant at Four Mile Lake, near Chelsea, Mich., has started grinding clinker for the first time.

The Elk Rapids Portland Cement & Lime Company will resume operations. Many changes will be made and thorough repairs effected to convert the mill from the wet to the dry process.

The Sheriff of Elkhart County, Ind., has under the orders of the County Court deeded the Bristone Power Company's land to the purchaser under a judicial sale, on a judgment against the Monolith Portland Cement Co. for $11,000, while the judgments against the Cement Company amount to $244,920, the power plant being the only visible asset of the Monolith Cement Company.

The Ashland Iron & Mining Co. of Ashland, Ky., is erecting a slag cement mill. Two buildings, 50x95 feet each, are under construction. Five hundred barrels of cement per day is the promised capacity of the works, which are to be electrically operated. Several lime kilns are to be built to furnish the lime used in the manufacture of the cement. The waste heat from the iron furnace will be used to coleine the lime, the lime stone being quarried from the neighboring hills.

At its annual meeting yesterday held at the offices of the Great Northern Cement Co., the Marlborough Land & Improvement Co. elected the following directors: Howard H. Parsons, Detroit; Dr. C. W. Munson, Toledo; J. H. Doring, Wapakoneata, O.; Col. Fred E. Fransworth, Marlborough; Eli Myers, Lebanon, Ind.; W. H. Fledderjohann, Decatur, Ind.; Henry E. Whitmore, Findlay, O.; Dr. George L. Shoemaker, Manchester, Ind.; Carl Mueller, Chicago; J. M. Bulkley, Detroit; S. B. Wagner, Ada, O.; W. L. Missinger, Wilmington, Del. The following are the officers selected for the ensuing year: Howard H. Parsons, president; Dr. C. W. Munson, vice president; Col. Fred E. Farnsworth, general manager and treasurer; Eli Myers, secretary; Vernon Blakely, assistant secretary.

The General offices of the Great Northern Portland Cement Co., now at Marlboro, are to be removed to Detroit.

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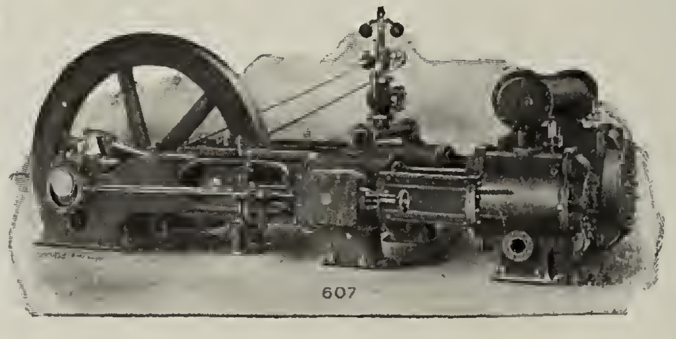

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Wanted—Chief chemist, thoroughly experienced to take responsible charge of 1,500-barrel dry process plant. State fully past experience and salary, with references. Address "Box A," care of Cement & Engineering News, 162 LaSalle St., Chicago, Ill.

Wanted—An experienced chief mechanic and millwright in cement plant having eight kilns. Will pay good salary to responsible man, and one who can take charge of repairs to machinery. Give full description of past engagements, and submit references. Address "Box E," care of Cement & Engineering News, 162 LaSalle St., Chicago, Ill.

Wanted, for April 1st—Night superintendent in a large Portland cement plant. Applicants must have had good experience with dry process, and ball and tube mills. State salary required and qualifications. Alsen's American Portland Cement Works, Alsen, Greene Co., N. Y.

Chemist Wanted—A good analytical chemist, with some experience in a cement works laboratory, wanted by a large eastern cement company as assistant chemist. Unusual opportunities afforded. Answer, with full particulars. Address "C. P.," care of Cement & Engineering News, 162 LaSalle St., Chicago, Ill.

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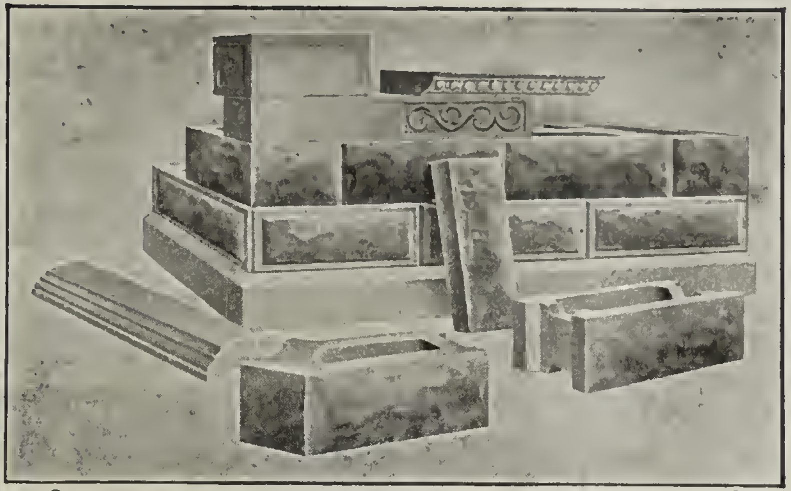
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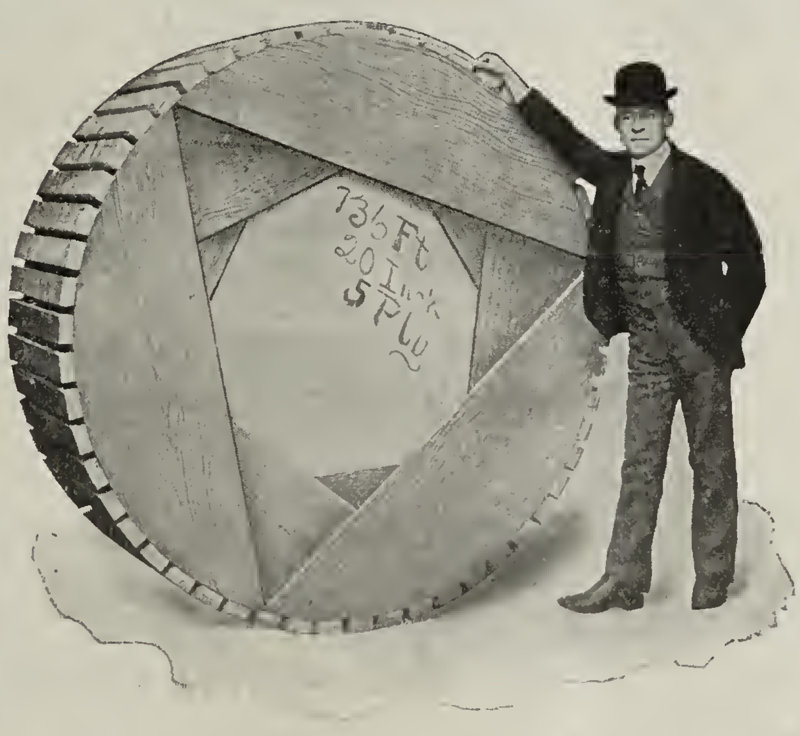

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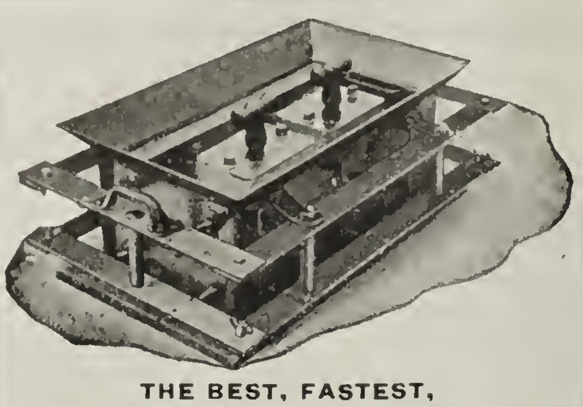

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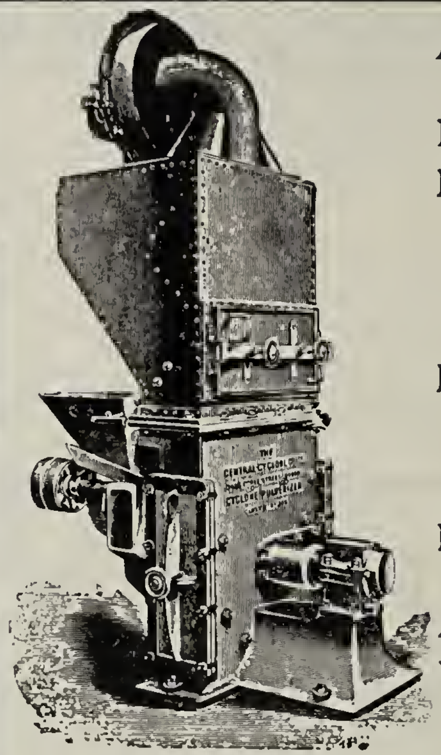

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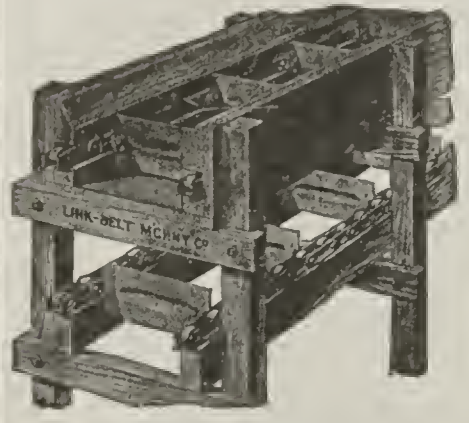

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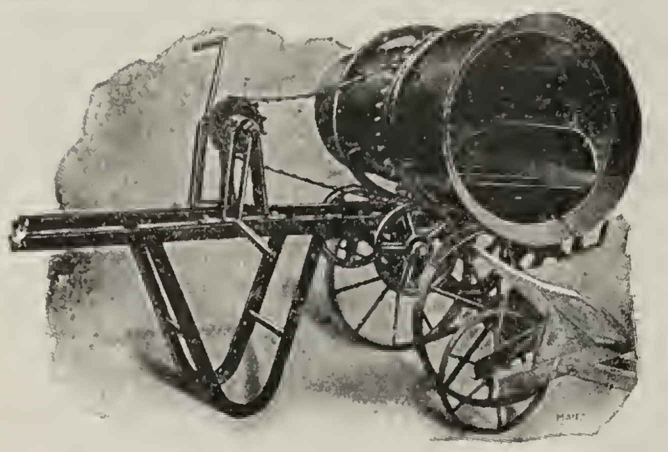

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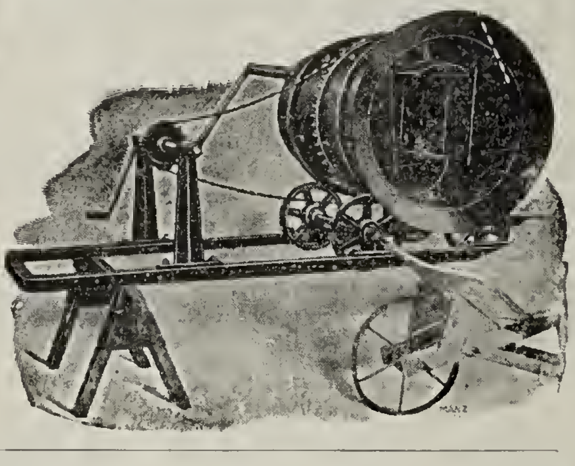

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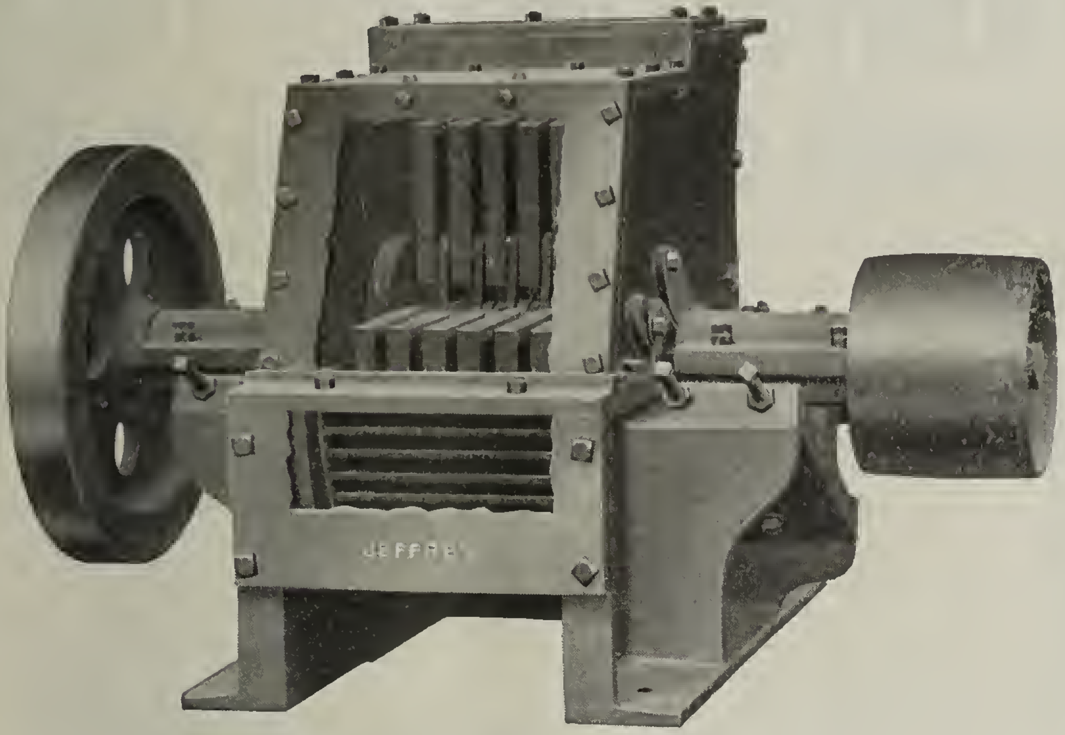

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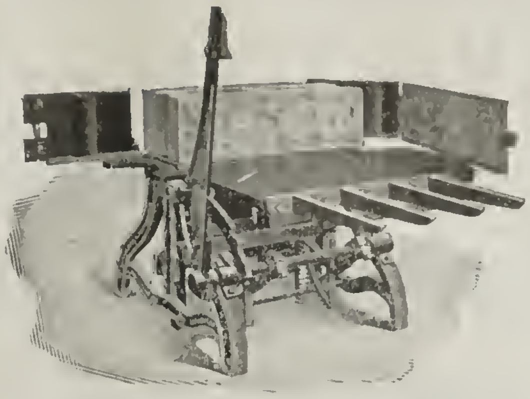

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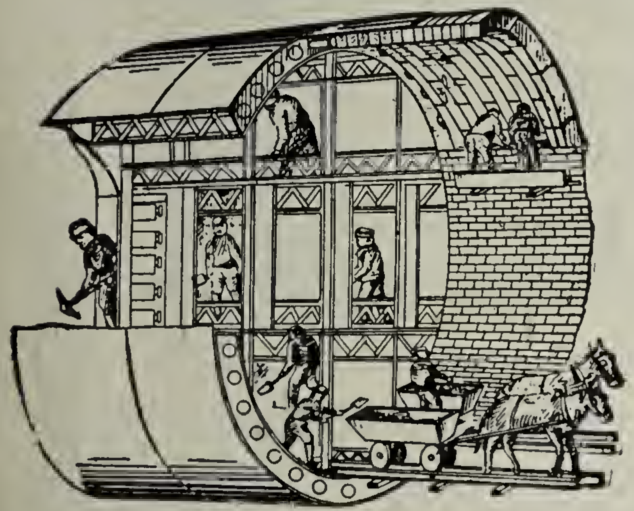

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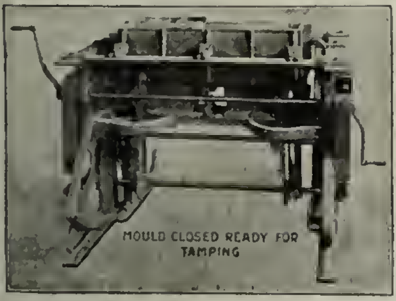

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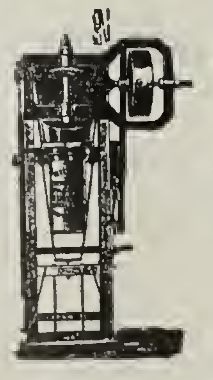

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The United States Circuit Court for the Western District of Kentucky, at Owensboro, June 2, issued an injunction against Spayd and Bennett, restraining them from making or selling any machine or apparatus for making building blocks embodying or employing the inventions and improvements made and claimed by H. S. Palmer, in patents Nos. 375, 377, Dec. 27, 1887, 623, 686, April 25, 1899, 727, 427, May 5, 1903 and 727, 428, May 5. 1903.

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CEMENT
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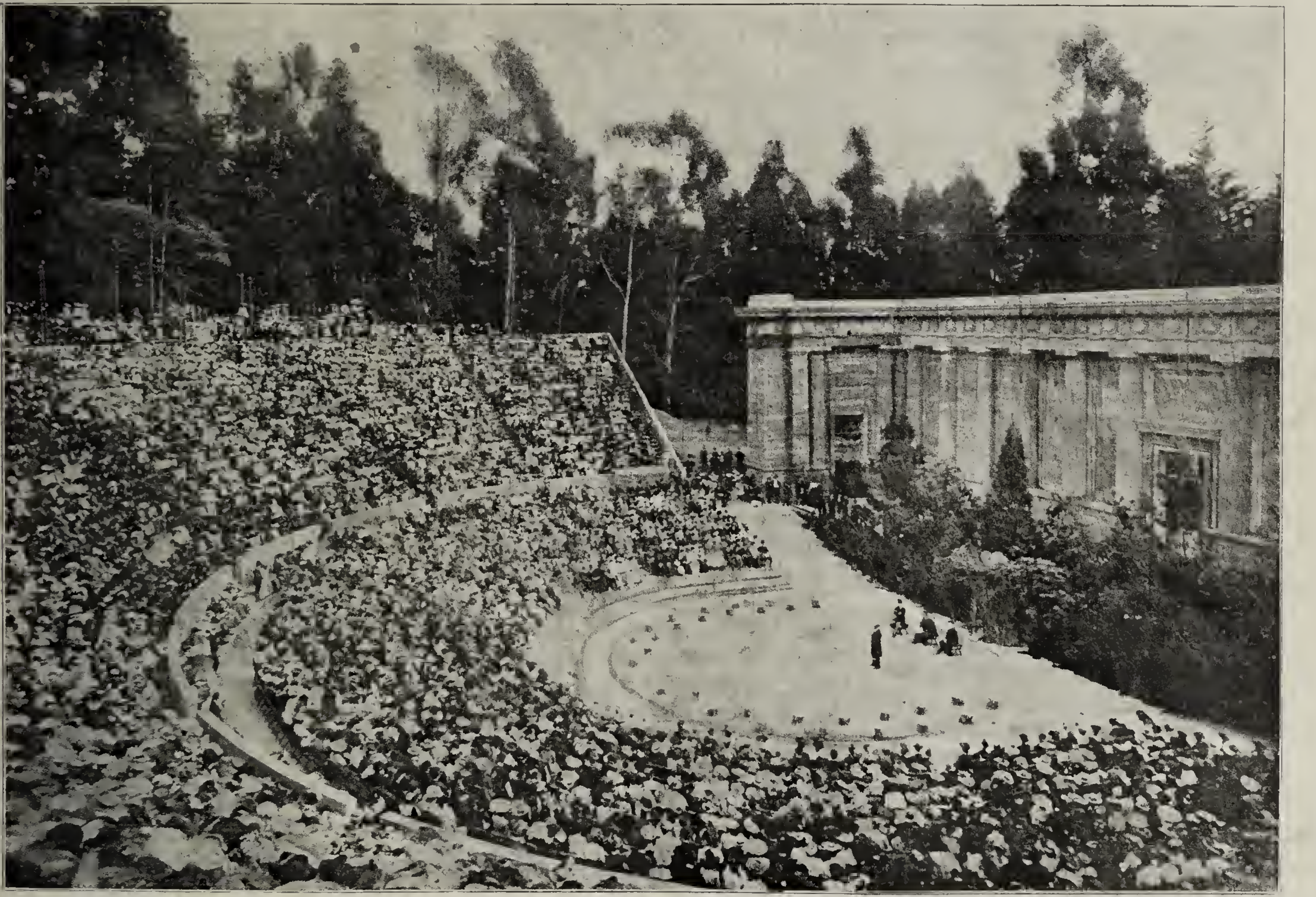

Classical Theatre Constructed of Concrete at Berkeley, Cal., John Galen Hovard, Architect.

The University of California has from time to time erected buildings of concrete. Our illustration shows the latest structure in this material, which was given to the university by Mrs. Phoebe Hurst. It will be used for the production of classical and other plays. The Auditorium is 254 ft. 8 in. wide over all, divided into inner and outer circles by a wall 4 ft. high: the inner circle will seat 1,454 persons on 22 rows of steps, while the outer row of steps will seat 4,228 persons on 22 rows of steps, the entire seating capacity being 5,682 persons. The stage is 146 ft. 10 in. wide over all by 33 ft. deep; the stage floor is 5 ft. 5 in. above the pit, by 40 ft. 8 in. high. 100,000 cubic feet of concrete were used in the construction of the theatre.

CEMENT AND ENGINEERING NEWS
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CHICAGO, MARCH, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

FIRE INSURANCE ON CONCRETE BLOCK BUILDINGS.

Concrete building block manufacturers find insurance rates on concrete block constructed buildings in a very much unsettled condition. One agent will make a rate the same as for brick or stone, while another will classify block construction with frame buildings, while other agents refuse to take the risk at any price.

A number of instances have come to our notice where the owner was favorable to the concrete block construction and was anxious to have it, but when the question of insurance was being considered the local agent absolutely refused to take the risk. This caused the loss of a sale for the block, as the owner did not want to carry his own insurance. He was in a measure compelled to take brick for his building. Real estate men have likewise refused to make building loans on block constructed houses, simply because they were ignorant of the good qualities of concrete for building purposes. Yet, strange to say, insurance companies have in numerous instances made building loans on concrete building block houses wheer real estate men have in the first instance absolutely refused such loans.

What the building block manufacturer desires is a classification and a proper rate, based solely on the intrinsic fire resisting properties of concrete as compared with brick, stone and wood construction. It will assist in giving a wider field for the cement block industry.

The National Board of Fire Underwriters, composed of 120 leading fire insurance companies doing business in the United States, have determined to influence the introduction of improved and safe methods of building construction in order to reduce the fire waste in this country, which now greatly exceeds that of all other countries, and to attain this end have organized an engineering department composed of men of high standing in their profession, and through them to investigate conditions and state facts as they find them and make recommendations for improvements. A staff of engineers are now in the field making investigations. The entire work of the committee is under the direct supervision of Mr. Herbert Wilmerding, 135 William street, New York City. Concrete construction in all its forms will receive full investigation. The committee request the co-operation of the various building industries. Information relating to cement construction is especially desirable.

While these engineers will not fix insurance rates, they will furnish the data upon which such rates will be based. The building block industry must certainly be generally benefited by the investigation now in progress, a proper and just rating being assured.

Thomas Sharp, mayor of Winnipeg, Manitoba, one of the most extensive building contractors in the northwest, while at Ottawa on municipal business, was interviewed on the subject of Portland cement. He said "there is no material in Canada equal to cement for construction work, and I believe the years are not far distant when mostly everything will be built of cement. Contractors, builders and in fact everybody who has building to do are endeavoring to get the cheapest and most durable material, and cement fills the bill. The people of Winnipeg and the province of Manitoba used last year nearly two hundred thousand barrels of cement. Thirteen years ago they did not use more than one thousand barrels a year. At that time I handled the most of it myself. Last year the city of Winnipeg used about thirty thousand barrels for public work alone and the company I am connected with used about thirty-eight thousand barrels. I firmly believe the use of cement as a material for construction will be increased five hundred per cent during the next two years.

"Edmonton, Calgary, Regina and all the other towns and cities throughout the west are adopting cement sidewalks in preference to the old wooden ones and they are using it altogether for waterways, sewers, catch basins, etc. Why? Simply because it is cheaper, lasts much longer and gives better satisfaction.

"By using cement instead of brick to construct a large sewer in the city of Winnipeg last summer we saved thirty thousand dollars. The contract price was one hundred and twenty thousand dollars. One great advantage in favor of using cement is that the work can be done by unskilled laborers.

GOVERNMENT USING IT.

"The use of cement is an educational question," continued Mayor Sharpe, "and I maintain that the Dominion government should send out experts to teach the farmers and others how to use it. Especially should this work be done in the West, where we are going to build up cities, not towns, and I believe the people will take advantage of using this most indestructible fire and frost proof material. A few years ago the government objected to using cement for constructing their own buildings, but they apparently see the advantage of doing so now, for among the large buildings they are erecting in the West is the Dominion Immigration building at Winnipeg, the foundation of which is constructed entirely of cement. Owing to some soft places they could not have used stone for this work. The foundation of the C. P. R. shops at Winnipeg is also built of cement.

"To put the matter in a nutshell," concluded Mayor Sharpe as he hust-

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JANUARY				TWELVE MONTHS ENDING JANUARY			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom	....	....	6,664,000	20,945	38,034,392	120,319	6,997,424	22,910
Belgium	19,246.582	55,357	14,117,738	46,342	140,778,157	423,950	106,340,663	350,439
France	595,200	2,554	595,200	2,554	3,607,685	15,137	5,511,299	21,713
Germany	6,375,008	19,540	13,184,900	36,535	264,855,282	905,661	149,470,567	503,289
All Other Europe	....	....	1,962	5	3,531,635	9,520	1,226,901	4,219
British North Am.	....	....	....	....	885.995	4,148	144,915	763
Other Countries	....	....	40,000	164	3,261,050	13,255	1,869,264	7,156
TOTAL	26,216,790	77,451	34,603,800	106,545	454,954,156	1,491,900	271,561,033	910,489
Domestic Exports of Cement, bbls.	11,388	17,837	42.152	64,694	188,384	281,815	631,585	902,542

There were 15,740,502 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in January, 1904, valued at $52,363, against 11,090,814 lbs., valued at $35,554, in December, 1904.

Imports of asphaltum or bitumen for January, 1904, were 7,463 tons, valued at $21,586; January, 1905, 6,534 tons, valued at $33,956. For seven months ending January, 1904, 110,479 tons, valued at $333,415; for seven months ending January, 1905, 75,859 tons, valued at $342.012.

led away to catch his train for New York, "cement has a promising future before it and I wish we had several more factories in Canada like the one in your transpontine city, for I believe the demand will always be greater than the supply."

(The following papers were read at Cement Users' Convention, Ames, Iowa.)

THE CONCRETE BLOCK INDUSTRY.

By O. W. Miracle, Minneapolis, Minn.

The subject assigned me is a very broad one, one on which volumes could be written, and I shall simply treat it in a general way from the standpoint of a practitioner, and leave the scientific and technical points to others with laboratory experience. Before taking up my subject, however, I wish to digress just a little to congratulate you upon this splendid opportunity of assembling here under the fostering arm of this grand institution, whose foundations were so carefully and firmly laid and whose superstruction has been so well and strongly built that it stands to-day, second to none in the land and the recognized peer of any institution of its kind in the world. We must not forget, gentlemen, the debt of gratitude we owe to the efficient personnel of this faculty by whose faithfulness and untiring efforts and careful research the Iowa State College has been placed in the enviable position it now occupies, and whose graciousness and interest in the development of this great industry which you represent, makes it possible for you to meet here on this occasion.

This is the third convention of this nature it has been my privilege to attend during the past sixty days, and I want to say, I challenge any industry to bring together a more intelligent and at the same time a more studious lot of representatives. Every man in attendance has shown a great thirst for knowledge and a desire to benefit by every word that has been said, and every one, whether customer or competitor, friend or foe, has shown the greatest interest in the lessons taught and has realized the broad field which we occupy and the necessity for co-operation and a more thorough knowledge of the business in all its branches.

The various papers which are read here on these different subjects are bound to bring out a lot of useful information, so let us apply ourselves studiously with a determination to get all there is in the lessons which we receive here. Let us have a regular old fashioned experience meeting; let us compare notes. We have all had more or less difficulty and little annoyance and have overcome them. Let us tell each other how we have overcome them and see whose methods are the best, and in that way learn from each other.

That the use of concrete is nearly as old as the art of building itself is evidenced by the discovery of concrete masonry in the ruins of ancient Rome, and in fact in all parts of the old world.

We are told that Portland cement receives its name from its close resemblance to Portland stone which comes from a small island lying to the south of England. St. Paul's Cathedral and most of the public buildings of London are built of this stone and it is said to resemble very closely our Bedford stone, which has been so generally used in this country.

At first, Portland cement was used only in the form of mortar but the joints made of it were found to be stronger and more durable than the stone itself, hence its use was taken up for the whole structure. Less than ten years ago, we in this western country thought that no Portland cement was really fit to use unless it was imported. But modern business methods and up to date machinery have placed an American product on the market, better than the foreign product and in such quantities as stagger the imagination. Last year the cement mills of this country turned out twenty-three millions of barrels of Portland cement. Enough to make 530,400,000 cubic feet of solid concrete, mixed in the proportion of one to four or 736,000,000 cubic feet of the average hollow block wall mixed in the same proportion. This would lay up a wall one foot thick and twenty feet high, 6,980 miles long. This would lay up a wall twenty-five feet high around the State of Iowa and on every county line. It would build a cement walk five feet wide, 60,000 miles long, or nearly twice and a half times around the world. Truly this is the concrete age, and we are right in the midst of it. At first concrete was used only for footings, later, foundations, and finally for the superstructure. For this purpose, expensive wood forms had to be built and then removed after the concrete had set. So the idea was developed of molding it into blocks and laying them in the wall the same as brick or stone. From this was evolved the idea of making these blocks hollow, in order to save material, making the walls lighter, dryer and warmer than when made solid. Then again it is practical to make the face of the blocks as ornamental as may be desired. So to-day we have the Hollow Concrete Block on a commercial basis, a great branch of the cement industry and a lively competitor of brick, stone and lumber.

With such an enormous growth it naturally follows that some will go into the business who are lacking in the necessary funds, knowledge and push to make a success and will fail while others will succeed immensely, and that is just wherein lies the value of these meetings. They will develop reliable literature on the subject so that the new recruit may have some guide, some reliable information aside from that given him by the, sometimes, overzealous agent who sells him his machine. He will have a reliable formula and reliable instructions on block making. The demand is so great for this material and the profits so alluring that it is attracting men from all trades and professions. I know from my own experience whereof I speak, as we have among our customers, lumbermen, merchants, hardware dealers, dentists, doctors, lawyers, bankers, contractors and even politicians, and that is why, as I have stated above, that the new recruit must move carefully and avoid mistakes, as one little break in getting out a few blocks that are not just right will do more harm than can be overcome by a thousand good jobs. Keep the quality of your material up to the highest possible standard and remember that your critics are many and active. They never miss seeing any little flaw and never forget to mention it. I have been asked a good many times by prospective purchasers, of blocks, how they could tell when the blocks were properly made, whether they had the necessary amount of cement and a whole lot of other questions along this line, and I have invariably given them the same reply: "If you don't have absolute confidence in the man who makes the blocks, and sells them to you, if you don't believe he will put his integrity and honor into every stone he sells you, *don't buy* them." These are facts, gentlemen, and now don't let's abuse the confidence people must place in us. Let us select our material carefully. Let us use good, clean sharp sand and aggregates. Let us use the best Portland cement and *plenty* of it, never a less mixture than one part cement to four parts sand, and then let us see that these ingredients are carefully and thoroughly mixed, well tamped, and then let us cure our blocks well, keeping them thoroughly moistened for at least a week, and let them cure three weeks more at least before putting them into the wall. And finally, let us get a price commensurate with the high quality of the material. I hear so much talk about cheapness, cheap, cheap. Don't do it. Don't talk it. Don't think it. Let us get away from this idea of cheapness and talk quality for a while and then give it to our customers. Most men are willing to pay a respectable price for this material if they know they are getting the quality.

I know of no business so susceptible to trickery and manipulation as this block business. The average man who buys blocks has no way of knowing whether they have been properly made or not, whether they contain enough cement or not, and whether or not they will meet the requirements needed. Therefore I want to emphasize this point again, that as manufacturers of concrete building blocks, we must move carefully and establish our goods in the confidence of the people who are to use them.

On the other hand, I challenge any man to show me a business, with such pleasant surroundings, that with equal capital, proper attention, the right kind of push, energy and integrity, will yield anywhere near the profits that can be made from this business. True; in some localities it is a campaign of education at the start but you have all the good points on your side. Fire tests have shown concrete to be the only actually *fireproof* material used in building construction. It is beautiful, easily ornamented, and much cheaper than cut stone or pressed brick. There is a great saving in laying over brick or stone, and lumber is getting so high that it will soon be dearer than the concrete block, which is vermin and damp proof, warm in winter and cool in summer.

We have a great work to do with the insurance people and building inspectors. Most insurance companies are giving cement block buildings a cheaper rating than a building of any other material. But there are still isolated cases where the underwriting boards are not thoroughly convinced of the merits of the hollow block. I have a case in mind where a prospective customer was temporarily talked out of the notion of using them by his insurance agent who told him at first that his building of blocks would take the same rate as a brick veneer and the insurance would cost $180 per year more on a building 66x120, three stories high, than if built of brick. But as I say, these cases are only isolated ones, and this prejudice will soon be overcome if we make our material right.

On the other hand I had a little experience with a building inspector recently in a southern city who told me that if a concrete block building was erected in his town, the amount of hollow space in the wall would have to be made up for in extra thickness. That is where the ordinance required a 12-inch brick wall, if blocks were substituted and they contained 33 per cent air space, the wall would have to be made 16 inches thick. Now you who have had practical experience know that this was a ridiculous conclusion but this is another isolated case and I think I convinced this inspector of the error of his ways.

Now, gentlemen, many of you have realized, as one of our eastern friends said the other day, "That fortune knocks at your door but once, and have invited her in." You stand today the representatives of a branch of commerce which promises to outstrip even the great strides made by the iron and steel industry and you hold its fate in your own hands, and I charge you to go forth from this meeting with a full realization of our responsibility and the duty you owe to yourselves and the trade. Be overcautious and don't lose sight of the fact that success will crown your efforts and your emoluments will be large so long as your product is right, while on the other hand, if your product is wrong, you will find failure staring you in the face very early in the game.

CURING OF CEMENT BLOCKS.

The subject for discussion is curing cement blocks. This industry is too new for anyone to say this method, or that method, is the only one. Therefore my remarks will be based entirely on my own experience. In treating this subject I will consider nothing but the perfect block; this means, sharp clean sand,* good cement, proper proportions, thoroughly mixed, thoroughly tamped, and placed in the shade. A block otherwise well made but poorly cured, is worthless, and a block poorly made and well cured is worthless, so great care must be taken in all stages of its manufacture. A good product means a prosperous industry, and a prosperous industry means much to us all in this age of progress. One of the most important features of block manufacturing is the curing process; a block must be cured uniformly, the primal requisite in proper curing is plenty of water. No stated time can be given for beginning the sprinkling, as all depends on the atmospheric conditions; some days you can begin sprinkling three hours after the block is moulded, while at other times, five to eight hours will elapse before you can apply water with safety; the moment you detect the face or outer surface turning light, it is a sure sign the block needs water; and they must be sprinkled as often as this is noticed; you can't make them too wet; this process should continue for at least 48 hours, or until the blocks can be removed from the palates, lathed and piled. By lathing each tier it allows the blocks to dry uniformly. This water cure continues from five to eight days. All of our sprinkling is done with a hose and spray, and this is carefully attended to by *one* man. We have found that blocks can only be successfully cured by one experienced man. What is everybody's business is nobody's business, and the blocks cannot and must not be neglected. We have carried out this plan ever since our third day's product was ruined by too many men attempting to superintend the water cure. We hear of some people who advocate the process of curing blocks under water. Actual experience tells me this is a failure for two reasons; first, it is not practical; second, it means extra labor and expense. Imagine what an area it would require to submerge the product of five days' labor, which means about 600 blocks from the average machine. One can see at a glance this is impractical for the ordinary manufacturer. We cannot reach the height of this industry at a single bound, but must mount the ladder round by round. Don't discourage the small manufacturer, rather encourage him. Don't make these discussions too complex, but rather offer what you know to be the result of ripe experience. To make this a permanent industry, we must have the co-operation of all, to learn and know the best methods of block making and curing. There are always some who look upon a new industry with a skeptical eye, so we cannot afford to be too eager to place our product on the market, and allow a green block to be placed in a wall.

In these few remarks I have endeavored to give you a definite idea as to the curing of cement building blocks, and in closing I will raise the finger of prophecy, and tell you that without a doubt in the next few years you will see all our finest office buildings, and most beautiful residences, and largest factories, erected with concrete products.

Consequently, it behooves us to make honest blocks. Let honesty be the watchword of our industry.

JAS. WIMMER,
Perry, Dallas Co., Iowa.

COST OF MAKING, AND PRICES CHARGED FOR BUILDING BLOCKS, SIDEWALKS, ETC.

BY L. L. BINGHAM.

The cement block manufacturer must constantly use his pencil in order to know the exact cost of production in order to be able to make close prices on sales, as business cannot always be conducted on the block machine salesman's alluring low figures on cost of production.

Under unusually favorable conditions, their figures can no doubt be duplicated, but each cement user must find out for himself not what his lowest, but what his average cost of production is, under his own peculiar local conditions. Most of us have done this. Men with enough enterprise to attend conventions have little use for guesswork in their business; but after figuring for oneself, it is always interesting to compare notes with one's neighbors, and such is the purpose of the present paper.

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*The presence of up to 6 per cent clay in the sand will produce stronger work. Clay which does not discolor the block should be used.—Ed.

In order to obtain reliable figures for reasonably accurate averages relating to cost of manufacture and selling prices of cement products, a list of thirty-six questions was mailed to 112 building block and sidewalk men in Iowa, Minnesota, Illinois, Missouri and Nebraska, requesting their co-operation. The extremes in the answers received were rejected, time being too limited to inquire into the evident unusual conditions on which they were based.

Owing to the lack of uniformity in size of the blocks made on different machines, it became necessary to first reduce the information gathered to terms of wall face feet. For instance, since each block 8 inches high and 24 inches long contains one and one-third wall feet, if an informant stated that he made 100 such blocks per day, his daily output was tabulated at 133 1-3 feet of the thickness of wall given. Nine and 10 inch walls were classed together as 10-inch, the divisions considered being 8-inch, 10-inch and 12-inch walls.

More replies having been received relative to 9-inch and 10-inch walls that size will be taken as typical. Please remember that figures given, unless otherwise stated, have reference, not to blocks, but to wall face feet.

The cost of sand at the different factories was from 0 to 4½ cents per foot, ranging mainly from 1½ to 2½ and averaging within a small fraction of 2 cents.

By an oversight, the question of per barrel cost of cement in the different towns was omitted, but it is probably safe to arbitrarily fix it at $1.60, and interested persons should note the difference when comparing average state results with their own. On this cost per barrel of cement basis, and figuring the number of blocks per barrel made at the different factories reporting, we find the seemingly very wide range of 3 to 7½ cents per foot, due partly to differing percentages of air chamber, but mainly to the proportions of cement and sand. The average was a trifle over 4½ cents per foot for cement.

The *labor* expense of making blocks includes not only the moulding, but also the sprinkling, and any necessary handling, during and after curing. The average wages paid at the different factories for skilled and unskilled labor was found to be $1.83 per day, and their average output 48½ feet per man, or a labor expense of 3 4-5 cents per foot.

Summing the averages of 2 cents for sand, 4½ cents for cement, and 3 4-5 cents for labor, we have practically 10 1-3 cents per wall face foot as the average Iowa material and labor cost of cement blocks for a 10-inch wall. This is true only in so far as the various replies received indicate actual conditions obtaining throughout the state.

Labor and material are not the only items entering into the cost of production. Interest, depreciation, replacement and incidentals must also be taken into consideration: Interest on money invested in ground, factory, machinery, moulds, etc.; depreciation of the plant and outfit through natural wear; replacement made necessary by the rapidity with which the machinery of this growing young industry becomes antiquated—only a few months sometimes between the purchase of one machine and the invention of a better; and lastly, *incidentals,* the extent of whose yearly aggregate only one who has kept accurate accounts has any conception.

These supplementary but exceedingly important factors in cost production depend so entirely upon local conditions as scarcely to admit of satisfactory average computation. One man may use railroad ground for his site, erect a $200 shed, install a $300 outfit, let his bills run, plan to sell out to a stock company before purchasing another machine, and for the same reason keep down his incidental expenses. Another man whose present rate of production is no greater, may own a $1,000 site on which he erects a permanent factory at a cost of say $2,500, equipped it with an $2,000 outfit, and deposits another $2,000 in the bank for working capital, and invested liberally yet wisely in advertising, subscription to trade papers, purchase of cement library, postage, investigation and convention trips, etc. To many Iowa block factories, even this outlay would seem small, but they are of course heavier producers.

Within the range of conditions covered by the two imaginary cases cited is an actual one which may give force to the importance of taking into consideration the supplementary cost items mentioned.

In collecting the material for this paper, I was permitted to look over the books of a firm which last summer made forty carloads of building blocks, and nearly 30,000 square feet of walk, beside doing some other work on the side. An average sized concern. They had kept a very carefully itemized record of the business, entering separately plant cost and equipment, sand, cement, labor and incidentals. This last item footed up for the season $1,099.41. Supposing that but half of this incidental expense was properly chargeable to the building block department, and adding to that the interest on $2,500 invested in the plant and equipment, putting in $50 for the season's block breakage bill, and $200 for depreciation and replacement, and dividing this total by the 20,000 feet of blocks made, it gives us within a fraction of 5 cents per wall face foot as the legitimate and proper increased expense to add to the 10 1-3 cents material and labor cost, found to be the average, or a total actual manufacturing expense of 15 1-3 cents per foot per 10-inch wall. This 5 cents supplementary cost, however, is simply *one* firm's experience, and hence is interesting and suggestive, rather than authoritative, as applied to block manufacture in general.

Persons contemplating engaging in the building block industry should take such additional cost into consideration until his own carefully kept records give him a basis for estimating in accordance with his own local conditions.

The per foot labor and material cost of 8-inch wall block average just about 1 cent *less,* and of 12-inch 1 2-3 cents *more* than for the 10-inch wall.

Selling prices for small lots or large contracts varied only slightly, but ranged from 12¾ to 22½ cents for 8-inch and 10-inch, and as high as 33 1-3 cents for 12-inch, with an average of 17½ cents per square foot for 8-inch wall blocks, 20½ cents for 9 and 10-inch, and a fraction less than 26 cents for 12-inch.

The per foot labor and mortar cost of laying the blocks in the wall varied from 2½ to 9 cents, with an average of 5 cents.

Prices charged per lineal foot for window sills and caps average 38½ cents, coping 31 cents, belt course 35 cents.

Now very briefly as to cement sidewalks. The tabulated returns to the questions sent out refer only to the cost of construction of 4-inch soft walk.

The prices for sand and gravel varied from 40 cents to $2.25 per yard on the job, making an average per square foot cost of 1½ cents.

For the reason already given, and because a very large proportion of sidewalk men purchase locally, the cement cost has been estimated at $2 per barrel. Some are paying more, others considerably less, but on that basis the average cost for cement is 3 3-5 cents per square foot—variations being due to differing proportions of sand and cement.

The *labor* expense was based on each informant's statement of the number of men working in a crew, their wages, and the average number of feet put in per day. This gives an average per square foot labor cost of 2 1-5 cents.

The necessary supplementary cost items in sidewalk work are much smaller than in building block estimates, being chiefly the replacement of forms and stakes, canvass and paper covers, tools, mixing boxes or platforms, interest, etc. A fair estimate in my own experience was .0061 cent per square foot. If this tallies with the experience of others, it would indicate a total average state construction expense of practically 8 cents per square foot.

Prices obtained range from 8 cents to 16 cents running mainly from 10 cents to 12½ cents, and averaging a trifle less, 11½ cents.

Prices for 6-inch crossings averaged 18 2-3 cents per square foot; for curbings, 33 cents per lineal foot; for gutter, 17 cents; for residence steps, 45 cents per lineal foot for each riser, those with sides doubtless constituting the 50 to 60 cent class.

Average prices charged for heavy cement work were: Culverts and small arches, 27½ cents per cubic foot; abutments, 23 1-3 cents; machinery foundations, 23 cents.

I wish to call attention to the possibility in a great many instances of reducing the labor item in the cost of production. Not by paying less wages; good, energetic, careful workers are more often deserving of a raise than a cut; but by judicious selection of the men, wise planning of the work, and in case of building blocks, convenient arrangement of factory and storage yard. For instance, in the making of 4-inch sidewalk, three contractors, none of whom reported the putting in of any sub-walk drainage filling, stated that their labor expense was over 3 cents per foot, an unnecessary expense as compared with the average of between $3 and $4 per day. Two building block men, using the same make of moulds, working on the same sized blocks, and both paying their men $1.75 per day, reported a labor expense difference of nearly 2¼ cents per block.

REINFORCED CONCRETE CULVERTS FOR HIGHWAYS.

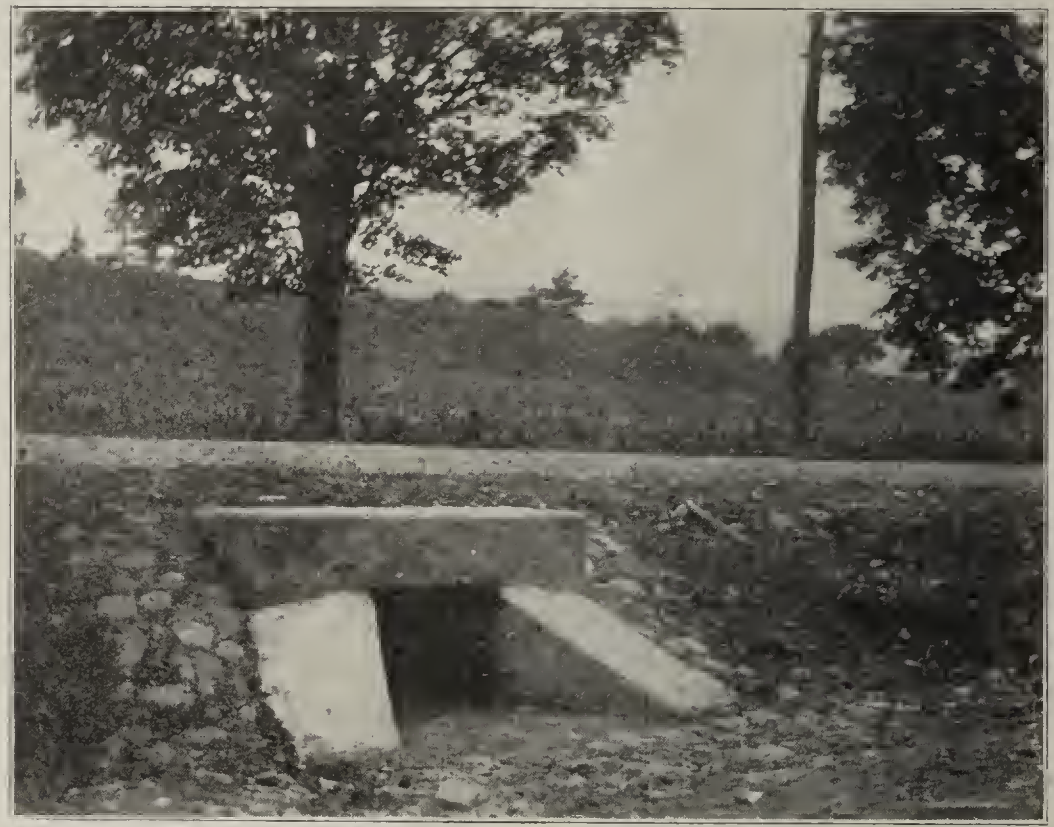
(Read before the Cement Users' Convention, Ames, Ia., March 2, 1905.)

The General Assembly of Iowa in 1904 passed two bills, the first of which created this college a State Highway Commission, and the second appropriated $7,000 for the work. The duties of the commission in regard to the road problem may be said to be unlimited in their scope, for the first of these, in the words of the act, is "to devise and adopt plans and systems of highway construction and maintenance suited to the needs of the different counties of the state . . ."

Highway construction and maintenance is so primarily concerned with proper drainage that the best and most economical designs for culverts and bridges have been among the first items to receive attention by the Iowa Commission.

As fast as possible the work of investigation has been pushed into the different counties of the state. Correspondence has not been relied upon to any considerable extent, but personal visits have been made to many of the counties and the question has been studied locally. Particular attention has been given to the itemized reports of county and township officials embracing the expenditure of the bridge and of the road taxes.

The data obtained in this way is of marked importance in helping to form a clear conception of the real status of bridge and culvert building throughout the state, and it all points very clearly to the importance of having more permanent structures and more competent administration of the funds available for this purpose.



Type of Culvert Used in "State Aid" Roads in New York State.

The Highway Commission now has under way a number of designs for reinforced concrete box culverts and are about to prepare plans for bridges with spans up to thirty feet in length.

Also in this connection the Commission has been made a member of an association of technical schools, engineering societies and cement manufacturing companies, which will make a long series of experiments with reinforced concrete construction, and we have been assigned the testing of culverts and bridges. This work will consist, as stated before, of preparing standard plans for culverts and bridges, sections of which will be built and tested here. After satisfactory designs are perfected they will be distributed free of charge to any who are interested in the work or who will use them in highway construction.

The Field.

All this work deals with an undeveloped field in Iowa. In the Eastern states where the "state aid" plan has been adopted and all permanent improvement is under state supervision, reinforced concrete is superseding all other material for such purposes Here, however, we have had a long and disastrous experience with various materials and as yet have no fixed policy. The bridge tax until last year was limited to three mills and could be increased only by vote of the people, and a few counties had increased their levy an additional mill in this way. More counties, however, neglecting to do this had become so badly indebted that the last General Assembly, to alleviate this condition, passed an act raising the maximum levy to four mills. A large number of counties have taken advantage of this act and now have the maximum levy.

In addition to the bridge fund proper, a considerable part of the one mill county road tax and of the four mill township road tax is deflected for bridge and culvert construction and maintenance. The actual amounts involved are very large and the loss to the state each year by poor administration of these funds is a heavy drain. For example, a county with a taxable valuation of six million dollars will have in its road and bridge funds, with maximum levies in each, almost $50,000.00 annually and in some counties the mulct tax is also used on the public roads. In Carroll County this tax alone adds some $16,000 per annum.

For 1904 the actual figures for the state were as follows:

(a) Township road tax	$2,283,129.64
(b) County road tax....	544,184.45
(c) County bridge tax..	1,628,719.89
Total	$4,456,033.98

Briefly, then, the road problem in Iowa is one that from a business standpoint no community, no township or county, can slight and not misuse a considerable sum of money, and one of the first lines of highway improvement which should undoubtedly be taken up is permanent construction for culverts and bridges.

Concrete Culverts.

The foregoing applies equally well to both bridges and culverts, but the rest will be limited to culverts, remembering that the same general type of construction is proving successful for spans of 25 to 30 feet.

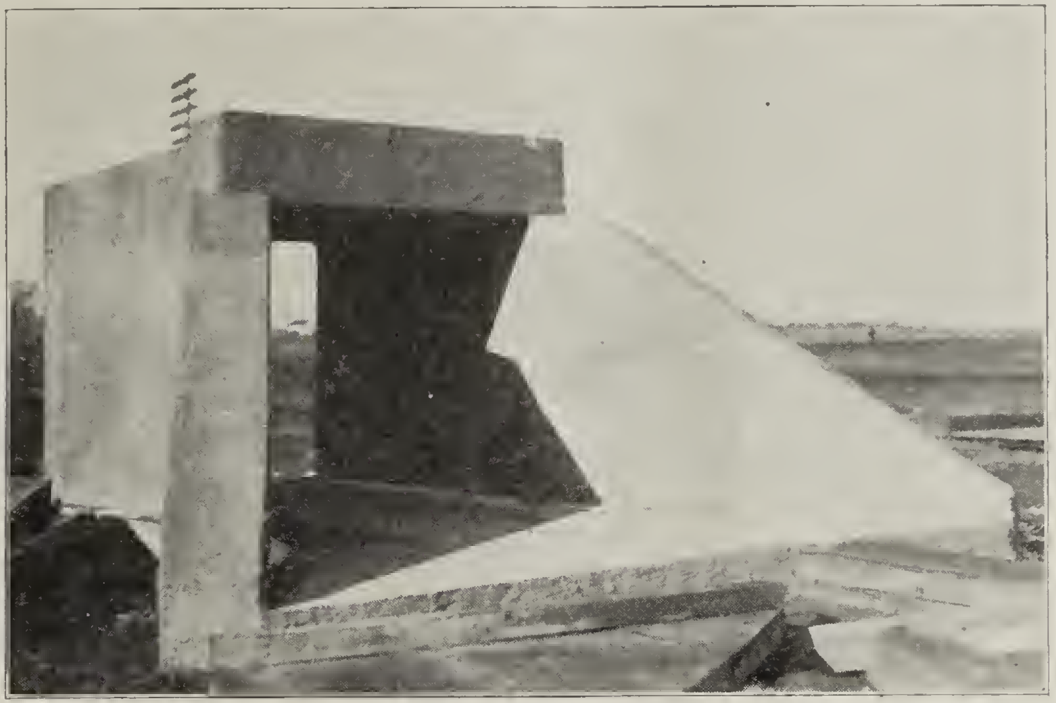
It is perhaps unnecessary to mention that the conditions which have to be met in introducing this form of construction generally over the state, due to our present political organization, present a more or less difficult problem, particularly with a limited appropriation. In most of the counties the townships are required to build and maintain all culverts and small bridges up to a sixteen-foot span. For each township there are usually three trustees, and in ninety-nine counties, averaging, say twelve townships each, there are over three thousand men whom it is necessary to convince that a type of construction radically different from the ones they are commonly using is better and more economical. Most of these men are practical farmers, men who are making a success of their business and are more or less prominent in their locality. Most of them, too, it is only fair to state, are anxious to spend the money intrusted to them in the best way possible. With these conditions in mind it becomes necessary to advance those reforms which will appeal to these men from a business standpoint.

As stated before, the experience with different materials which have been largely used for culverts has been costly. Tile and sewer pipe culverts as ordinarily used are not satisfactory, which is also true of cast iron and sheet iron, except where these materials have been used with so much concrete that it might have been more economically used in the entire construction. Lumber is becoming higher priced each year and the quality is becoming poorer. Three-inch planks of fir, hemlock and pine which have been largely used in culvert construction will cost in the neighborhood of $24.00 to $30.00 per M, while oak is now quoted at prohibitive figures. At such prices a two-plank culvert could not be built for less than $15.00. Taking the average life of such a structure as five years and money at 6 per cent, it would be more economical to put $50.00 into a permanent structure. These figures must be considered as only roughly approximate, but they illustrate the principle in question.

The second condition which arises is the general ignorance of the theory of concrete, or of steel reinforced concrete construction. The general lack of experienced men to take up the work involves an extreme simplicity of design which is also demanded by economy of material for centering and of labor.

The centering must be so designed that it can be used many times. Each township can then own a set of forms for a certain number of standard sized culverts, the initial cost of which, divided by the number of times they are used, will be very small.

The labor necessary, however, will be an important part of the total cost. In many parts of the state the aggregate for concrete can be procured so cheaply that economy of material should be sacrificed for economy of labor. Also the improper proportioning and the poor mixing which much of the concrete will receive necessitates the use of a larger factor of safety than is ordinarily thought sufficient, and for this about 6 seems to be a fair assumption.



Model Reinforced Concrete Box Culvert. Built as a Test Section by the Iowa State Highway Commission at Ames, Iowa.

The Design.

To meet these conditions a box reinforced concrete culvert was selected as the most simple and economical in design and it is this type of construction the commission will urge most earnestly for the shorter spans. (See Figs. 1 and 2.)

There are other conditions also which make the box culvert type desirable. Each side acts as a beam and the stresses may be easily and quite accurately figured. There is no thrust tending to force the walls outward as is true with arch culverts and they take only a direct compressive stress from the top. In most places also where a culvert is needed in highway construction the head room is so limited that an arch top could not be used and yet leave a sufficient covering of earth on top.

Wing walls should always be built and the preference is to be given in ordinary cases to the type shown in the sections of model culverts at the college which are flared 30 degrees from the axis of the culverts. These have proven more self-cleansing than the culvert, which have the wing walls parallel to the axis or at right angles to it. This is an important consideration since with the present imperfect road maintenance the culverts are not kept open at the ends.

Steel Reinforcements.

Although there are many patented forms of steel to be used in concrete steel construction, there are a variety of very common kinds of commercial steel which make good reinforcing material, such as barbed wire, and woven wire fence. This material can be purchased at almost any convenient hardware store. When such forms of steel are used and there are kinks or curves in it, it would seem very desirable to put it under some initial tension when it is placed in the concrete to avoid any tendency there would be for it to straighten out when it is subjected to stresses. Most of this wire, as shown by tests made at the college, has a high elastic limit, due probably to the work done upon it in drawing it out to such a small cross section.

A single wire such as is used in making barbed wire has a cross section approximately eight thousandths of a square inch and it would take a large number of wires to make a one per cent reinforcement even on the thin slabs, but it seems safe to use a less percentage of reinforcement when a fine wire is used because it is more easily distributed through the concrete than when in any of the patented forms. These bars can be purchased from many engineering contracting companies and are easier to handle than the wire. The Thacher, Johnson, Ransom and Kahn bars are among the most widely used as the reinforcing material.

As has been stated before, every side of the culvert is designed to act as a beam so that the proper proportioning and reinforcement is one of the essential features of the construction. The reinforcement in all cases should be placed as close to the surface of the tension side of the wall as is possible and for the thinner slabs it would be better to put a thin layer of mortar only under the forms rather than try to attempt a thin layer of concrete, particularly when broken stone concrete is used.

The most simple theory of this concrete steel construction apparently is almost unknown to many men who are now posing as bridge and culvert contractors in the state and the most simple principles are violated and concrete is used in the most haphazard way that it is not unlikely considerable dissatisfaction will be aroused to oppose the general use of concrete-steel construction for the highways. An instance of this happened in one of the counties of the state where a cement sidewalk builder branched out as a concrete culvert builder and made forms for arch top culverts with a span of six feet. He used twelve inches of concrete for the top and reinforced it with barbed wire, winding it about in such a manner that if it took any stress whatever it must have been one of compression. Such misuse as this of concrete and steel as building material must eventually destroy much of the prestige it now holds for durability, and it becomes the duty of each one familiar with the proper use of these materials to guide others. Township and county officials need to be given all possible information as to the economy of concrete and steel for culverts and bridges, so that they will generally adopt this type of construction for permanent road improvement.

MIXING CEMENT.

BY R. G. COUTTS, GRINNELL, IOWA.

Some people live in the past, surrounded by ideas, handed down from father to son, which are only recorded in old and musty books. They know of kings whose crowns have melted, of generals whose swords have rusted, of heroes whose luster has faded, and of extinct empires. Their eyes and ears are closed to the present. They have no heart for the living present.

With due reverence for the institutions and traditions of the past which held much that was good, heroic and noble, but our chief business is with to-day. Great to-day. A hundred burning issues face us, opportunities come trooping by. Duties press upon us which cannot be ignored. We belong not to ancient times but to these times.

We mix daily with people who are bound up in the past. We find them in all lines and the building industries are no exception. There are men who believe that a wall built of the roughest, most unsightly, crumbly, rotten rubble stone laid up in sand and lime mortar composed of 12 parts sand to 1 part lime, is just as good or better and looks just as well as the best concrete or cement stone that can be made, laid up in the most artistic manner. Well I am glad that the rubble stone man like the Indian with his "pipe of peace," is slowly passing away while the cement stone man like the Irishman with his "piece of pipe," has come prepared to stay. You asked me to discuss the topic, "The Mixing of Raw Materials in Cement Work." This is a big question, and one of the very greatest importance to this great thriving industry, in the interests of which this meeting has been called. It is so big that I will only be able in this short paper to touch the "high places." So I will simply ask you to consider with me for a few minutes, first the materials to be mixed and second how to mix them.

The country is flooded at the present time with specifications for the mixing of concrete sent out by men who claim to be authority on this subject that differ so widely that it is hard for the uninformed to determine just what the proper specification should be. But notwithstanding this great difference there is one point upon which they all agree, and that is that it takes cement, sand and crushed stone or gravel to make concrete.

The first of these we will speak of is cement. There are a great many brands of cement on the market today and many of them, indeed most of them are good, it is true there are some better than some others. The cement industry has increased more than any other that has been developed in recent years in this country. We have grown from one factory with an annual output of 300 barrels in 1875 to 78 factories with an annual output of 24,000,000 barrels in 1904. So that there is no difficulty as far as variety of brands to select from is concerned. It makes a very great difference of course as to what I want to use the cement for as to what brand I shall select. If it be simply for concrete foundation work I can safely use most any one. If it be for sidewalk work the time of setting, the shade of color produced after it has set makes a very great difference and the same is true in the manufacture of cement building blocks. Of course we have to make a great deal of allowance for the stories told us by the representatives of the different cement mills, for every man that is selling cement has one that is just a little better than that his competitor is selling, and in my opinion there is but one way that we can settle this question, that is by having our cement tested. Prof. Marstin announces that Iowa State College stands ready at all times to make these tests almost without expense to the cement user so there is no excuse for anyone using a cement that he is in any way doubtful about. I might say that I have been governed for the last two years in the purchase of my cement by the perusal of a bulletin issued by this college in December of 1902 which gave the results of a series of tests of eight different brands of Portland cement. I discovered that of the eight brands tested I had used six of them so I then selected the one that stood the best all-round test and dropped the others. I have used about twenty cars of this brand since without finding a bad sack in the whole lot. So to sum up my position on the cement question would simply be, buy the best thing you can find, have it thoroughly tested and when this is done you may proceed with comparative safety so far as the cement is concerned.

Now the next ingredient is sand and the proper selection of this is of no less importance than the cement. Good sand is something that is very hard to get. In our town we have no sand. Every grain of sand we use for all purposes has to be shipped in. There are several points along the Des Moines river where good clean sand can be obtained. Our nearest point of shipment from this source is forty miles. Thirty-six miles away is Marengo on the Iowa river but much of this sand is so full of dirt and quicksand that it is practically worthless. Our next supply comes from the sand banks owned by the Iowa Central Railroad Company at Gifford. There is a good deal of good sand there but the method employed in loading cars there (with steam shovel) makes it undesirable for concrete work. That loaded by hand is all right. It has about 30 per cent of gravel in it but all that can be utilized and hence is no loss to the shipper. Since the sand pumps have been installed in the Des Moines river at Eddyville a good supply of sharp sand can be secured that is all right, simply ideal for the manufacture of cement blocks and the supply is unlimited.

The next ingredient is crushed stone or gravel. In our locality the former is the most easily secured. For good concrete I prefer the hard blue stone. The cheapest thing that can be obtained is the magnesia lime stone which is to be found in large quantities in Jones and Cedar counties. My objection to this stone is its porosity, it absorbs the moisture from the concrete mass so rapidly that the concrete is really dry before chemical action takes place and hence is shorn of much of its strength, while on the other hand the hard lime stone has little or no porosity and so the "set" takes place by the chemical action of the cement and hence the entire strength of the concrete is retained.

Now we have the materials, No. 1 Portland cement, thoroughly tested, good clean sharp sand, hard limestone, crushed so largest piece will pass through a 1½ ring. Now how shall we mix them? The first thing we need is a good "concrete mixer." If you haven't got one you had better buy one at once. A good one can be bought at a reasonable price, and in my opinion no man or set of men who expect to do any great amount of concrete work can afford to be without a "mixer." Now the next thing is the selection of a strong active young man, one whose "bump" of common sense is well developed. Put him in full charge of the mixer. It shall be his business to see that all the ingredients to be mixed shall be accurately measured and deposited in the mixer in the proper order, and for concrete foundation shall consist of one measure of cement, three measures of sand, and five measures of crushed stone, the amount of water cannot be gauged by any iron clad rule. The condition of the dry materials as well as the condition of the atmosphere will to a great extent determine the amount of water to be used. This must all be left to the judgment of the man at the mixer. After these raw materials have been thoroughly mixed the product shall be placed in a trench 30 inches wide and 12 inches deep and thoroughly rammed and tamped into place with a heavy tamp. This mixture composed of the articles in proportion I have described will be found ample to carry any two-story building on most any of our Iowa soils. For a three-story building I would make it 16 inches deep and 36 inches wide.

Now for cement blocks I would mix one part of cement to four parts sand, no crushed stone.

For sidewalk work I would mix same as foundation work, put same down 4 inches thick, tamp down to 3 inches and while newly laid add a top coat on wearing surface mixed in the proportion of two parts cement to three parts sand and laid one inch thick same to be troweled to a smooth even surface. If these specifications are closely followed you will have a foundation that will prevent your building from cracking or settling, a cement stone that will not disintegrate, a sidewalk that will be "a thing of beauty and joy forever" to the owner and a living testimonial to the skill and integrity of the contractor.

Mr. Ernest McCullough, C. E., of the Municipal Engineering and Contracting Company, Chicago, read a paper at the Ames convention on "Practical Cement Testing Outside of the Laboratory."

He defines Natural, Puzzolan and Portland cements and describes the manufacture of each.

He suggests that cement may either be sent to a chemist or engineer to be tested or may be done by the purchaser himself.

A HANDBOOK FOR SUPERINTENDENTS OF CONSTRUCTION, ARCHITECTS, BUILDERS AND BUILDING INSPECTORS.

BY H. G. RICHEY.

7 by 4¼ in., 742 pages, 357 figures, Morocco, $4.00. Published by John Wiley & Sons, New York.

The author has placed before the reader a compact treatise, bristling with useful information on the subject of bulding construction and superintendence. It clearly describes the various materials used, pointing out their good and bad qualities and proper use, modern methods of construction, the trades employed and their tools. Numerous useful tables designed to simplify calculation are distributed through its pages which will be found a daily help to all engaged in building construction. One chapter is devoted to concrete and its use, with specifications for producing good sound work. The book treats the practical side of building construction.

THE VIENNA CEMENT WARE EXHIBITION.

The Vienna Technical Building Association have arranged for an exposition of cement ware and artificial stone products to be held at Vienna, Austria, from April 1 to May 15, 1905. Full information will be given by addressing the secretary of the exposition association at Wien VII, 2 Zollergasse 31, Austria. Great interest is being manifested in this prospective exposition throughout continental Europe.

The city of Grand Rapids, Mich., requires machine mixed concrete on all jobs using 2,000 cubic feet or over.

SPECIAL NOTICE.

Cement and Engineering News Will Remove May 1st from 162 to 226 La Salle Street, Chicago, Ill.

COMPETITIVE PRIZE ESSAYS ON HYDRAULIC CEMENTS.

In order to extend the knowledge of the properties of hydraulic cement and especially of Portland cement, the Prussian Minister of Public Works, jointly with heads of other departments and under participation of The Association of German Cement Manufacturers, issues the following prize competition for scientific papers on the chemical processes which take place during the hardening of hydraulic cements.

The prizes amount to the sum of 15,000 marks ($3,570), of which amount 10,000 marks ($2,380) have been granted by the Prussian and German governments and 5,000 marks ($1,190) by the Association of German Portland Cement Manufacturers.

The following questions are to be solved:

Demonstration of the properties and of the hardening process of calcareous hydraulic cements, synthetically, analytically, microscopically, mineralogically (hardening in air, fresh water, and sea water).

(*a*) To prove whether silicic acid, alumina, and oxide of iron combine themselves with lime as crystalloids in stable proportions or as colloids in varying proportions.

(*b*) To prove whether double combinations result between silicic acid, alumina, and oxide of iron with lime, and in which manner these substances are engaged in the hardening process.

(*c*) Consideration of the swelling phenomenon which accompanies the hydraulic hardening.

(*d*) Consideration of the influence of the temperature and length of time of the burning process on the different kinds of hydraulic cements.

(*e*) Properties of puzzolana and its hardening with lime. Beginning with silicic acid as the most active and prevailing puzzolana, alumina, oxide of iron, and manganese as independent, and in combination with silicic acid, as natural or artificial puzzolana.

The competitors may choose, for the purpose of investigation, any or all of the foregoing questions, in which case it is not considered necessary that the actual theories be accepted as a given direction.*

Papers should be inclosed in sealed envelopes marked "Zum Preisausschreiben, betreffend die Erhätung hydraulischer Bindemittel" and be addressed to the Ministerium der öffentlichen Arbeiten, Wilhelmstrasse 80, Berlin, W., which will accept said papers until 3 p. m. December 31, 1906. Papers should be signed with a pseudonym and the name of the author inclosed in a sealed envelope marked with the same pseudonym, which will only be opened in the case the paper receives a prize. All other papers will be returned to those persons who identify themselves by presenting the receipts for the delivery of the papers, or prove their identity in some other manner. Papers received after the date of delivery will not be considered.

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*If desired, information will be given to competitors about the tests and their results, which are at present being made with hydraulic cements in sea water on the island of Sylt. This information will be given by the Königliches Materialprüfungsamt in Gr. Lichterfelde W. 3, near Berlin, and by the Königliche Wasserbauinspektion in Husum. Permission can be obtained from these offices to use the laboratory in Westerland-Sylt for the purpose of making samples and using the tanks there, provided the official tests be not disturbed.

The participation is open to all nationalities, the only condition is that the papers should be written in the German language.

The prize jury is composed of the following gentlemen: Prof. Dr. van 't Hoff, Berlin; Prof. Dr. Scheibe, Wilmersdorf near Berlin; Doctor Michaelis, Berlin; E. Cramer (Tonindustrie-Zeitung), Berlin; Prof. Dr. Wilhelm Fresenius, Wiesbaden; Direktor Fr. Schott, Heidelberg; Dr. H. Passow, Hamburg; and of officials of the Konigliches Materialprufungsant in Grosse-Lichterfelde near Berlin.

The bestowal of one or more prizes is dependent on the value and importance of the papers and need not take place at all if there is no paper which seems deserving of a prize.

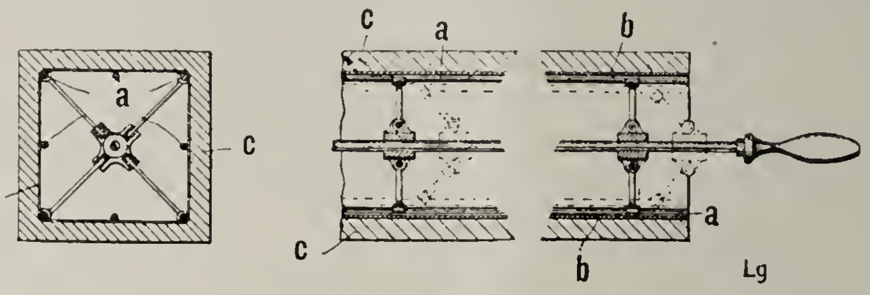
The minister of public works decides on the distribution of the prizes according to the judgment of the jury.

The intellectual ownership of the contents of the papers as well as the copyright remains with the authors.

The H. W. Caldwell & Son Co., Chicago, has issued a comprehensive illustrated general catalogue, No. 28, 736 pages, cloth bound, 6x9 in., covering elevating, conveying, and power transmitting machinery. It minutely describes and illustrates the general and special lines of machinery and appliances either manufactured or kept in stock by the company. Sufficient detailed information being given to enable prospective purchasers to form a fair idea of the articles offered. The firm is the sole manufacturer of the Helicord conveyor, double-disk friction clutches and the Caldwell-Walker machine moulded gears. This catalogue will hold special interest to the cement manufacturer, in which industry the Caldwell company have built up an extensive trade. Numerous diagrams and tables give exact data applicable for the installation and use of machinery and appliances employed in various different manufacturing enterprises.

HOLLOW ARTIFICIAL STONE MADE BY DIPPING.

Ernest Petzholtz has obtained German patent No. 150361, April 9, 1904, for procuring hollow concrete blocks by repeated dipping. A mould composed of a number of four-armed collapsible spiders mounted on a central shaft, which can be opened and closed like an umbrella. The spiders at the outer ends of the arms are connected by parallel rods, which move with the spider. When spider is extended the frame is covered with cloth or wound with wire and dipped into a reasonably thin cement mortar. The dipping is repeated until the walls are of the required thickness, when the material has hardened the central shaft is drawn partially out of the form, which causes the same to collapse, leaving the concrete block fully formed.



NEW BUILDING BLOCK FACTORIES.

Illinois.

R. S. Jones, Watseka.
Ed. Fox, Mt. Carroll.
F. B. Thomas, Tampico.
McKinney & Sons Co., Paxton.
G. W. O'Neil, Farmer City.

Indiana.

Geo. B. Lynch, Crawfordville.
R. S. McCray and A. R. Keaton, Shelbyville.
Miller & Goodwin, Waterloo.
John A. Carper, Waterloo.
Hosteller & Sons, Mitchell.

Iowa.

Electric Concrete Post Co., Lake City.
Frank Evans, Stuart.
Frank Brandon, Sidney.
Oskaloosa Cement Block Co., Oskaloosa.
Vaughan & Wood, Cedar Falls.
John Inglis, Ira.

Kansas.

H. Oldson, Kiowa.
J. B. Thompson, Kingman.
C. Jenkins, Kingman.
Fred Pyle, Garden City.
The Hunsberger Lumber Co., Moundridge.

Michigan.

F. E. Keyes, Bronson.

Minnesota.

J. L. Aiton, Alexandria.
W. R. Griffith, Anoka.
G. V. Clark, Little Falls.
Gould & Son, Fairmont.
Nelson & Swenson, Willmar.

Nebraska.

Geo. Roberts, Kearney.

New York.

A. J. Littlejohn, Seneca Falls.

Ohio.

Hedges & Simcox, Lancaster.

Pennsylvanna.

Geo. T. Thompson, Clearfield.

Wisconsin.

W. H. Haworth, Oconto.
F. Nerud and Thos. Buss, Elroy.
Riverside Cement Block Co., Janesville.
Murton & Thomas, New London.

Washington.

Rout & Biegle, Spokane.

West Virginia.

W. T. Rumble Construction Co., Elm Grove.

North Dakota.

Van Tuyl & Teutsch, Minot.
A. Johnson & Son, Amenia.

South Dakota.

August Goetz, Yankton.
Ekholm & Anderson, Faulkton.
Stover & Englesby, Watertown.

Tennessee.

G. A. Moody, Jefferson City.

The new Portland cement plant at Todd Creek, Van Couver Island, Canada, is about ready to start up. The raw materials, limestone and clay, are first-class. This is the old plant once controlled by officials of the Canadian Pacific Railway. Several hundred thousand dollars have been expended to modernize the plant. The rotary kiln process will be used, steam power will be used at present. Arrangements are complete for the development of water power on the Sooke river, sixteen miles from the works, for the generation of electricity, which will be used to operate the plant in the near future.

The Argus Leader, Sioux Falls, S. Dak., says: It is persistently rumored that another cement plant, backed by eastern capital, is to be located in the vicinity of Yankton. It is said that the new plant is to have a capacity of 1,000 barrels per day and will surely be installed if negotiations now under way are completed in a satisfactory manner.

The Marquis Clay and Limestone Company of New Castle, Pa., has absorbed the Pennsylvania Portland Cement Company, which is preparing to erect a cement plant near New Castle in the spring. Kilns will be erected also, for the manufacture of slack lime.

NOTES.

The Canadian cement manufacturers waited on the Dominion government and strongly urged that the duty on cement be raised from 12½ to 17 cents per hundred weight. The reason assigned is that American manufacturers get their coal cheaper, while the freight rates are lower, thus permitting easy competition. Seventeen companies were represented in the application, including the Portland Cement Company of Blue Lake.

A Building Trades Exposition will be held in London, England, at the Agricultural Hall, from April 29 to May 6, 1905. Cement and its products will form a part of the exhibits.

The Toledo Portland Cement Co. of Manchester, Mich., has given a deed of trust on its plant to the International Savings and Trust Co. of Pittsburg to secure $500,000 additional capital with which to go on with its business.

J. S. McMillin, of Roche Harbor, says he will build cement works at Roche Harbor, San Juan Co., Wash., in connection with the lime works he is now operating there. The new plant is to have a daily capacity of 2,400 barrels.

The Atlas Portland Cement Company's issue of $5,000,000, 6 per cent, 20 years' bonds, secured by trust deed upon its plants, were sold in New York at 7 per cent above par. The entire issue was over subscribed several times. A copy of the instrument was filed for record at New London, Rulls County, Mo.

The Green Island Co. of Green Island, China, (off the coast of Macao) have decided to build a new plant to increase their output of cement, which at present is 34,000 barrels per month. The new factory is to be equipped with rotary plants, two of which, with a capacity of 16,000 barrels per month, have already been ordered from England. The factory, which is to cost, including equipment, in the neighborhood of $400,000, will be large enough to accommodate two more rotary plants if required. The Green Island cement is sold largely to the Philippines and was the cement used in the construction of the Admiralty Dock at Hong Kong last year.

At the annual meeting of the Omega Portland Cement company all the old directors were re-elected except W. M. Eaton, who has removed to Rochester, N. Y. He was succeeded by AaronWorthing. The prospects for this year's business are very bright. The company declared a dividend on the stock on Feb. 10. The board of directors is composed of F. M. Stewart, F. A. Roethlisberger, Dr. W. H. Sawyer, Aaron Worthing, C. E. Lawrence, Israel Wickes, Dr. L. P. Hall of Ann Arbor, Dr. Lane of Angola, Indiana, C. B. Stowe of Cleveland. The officers of the company are F. M. Stewart, president; Israel Wickes, vice president; C. F. Wade, secretary, treasurer and general manager.

A deputation of Canadian cement manufacturers have gone to Ottawa with the view of influencing parliament, to increase the duty on cement, which is now 12c per hundredweight, in order to shut out competition from the states.

C. B. Lihne of La Salle, Ill., has purchased the controlling interest in the Illinois Hydraulic cement works, located one mile west of Utica, Ill. Mr. Lihme, who for a number of years has been chief chemist at the Illinois Zinc Works, will in the future devote his time to the interest of the cement business.

The Nazareth-Portland Cement company has approved plans to enlarge its plant to the capacity of a 3,000-barrel mill per day. This improvement will necessitate the erection of a new building. The plant at present has a capacity of 1,500 barrels per day.

The Wabash Portland Cement Co. has resumed operations.

A Portland cement plant to cost $200,000 will be erected at St. Ignace, Mackinac County, Mich., says the Alpena, Mich., News.

The Dodge Coal Storage Co. has acquired the business of the United Telpherage Company of New York. Communications intended for the latter company should be addressed to "The United Telpherage Department" of the Dodge Coal Storage Company, 49 Dey St., New York.

A slag cement plant is projected at Sydney, Ont. Slag from the Dominion Iron & Steel Co.'s Works will be used. The output is to be 500 barrels per day. English capital will float the enterprise.

Rapid City, South Dakota, has a project for a Portland cement plant.

George S. Schmidt, attorney at law of York, Pa., has made application to the state department at Harrisburg for the incorporation of the White Portland Cement company to manufacture, sell and deal in Portland cement and all kinds of natural cement, lime, limestone, calcined and other plasters and artificial stone and to mine clay, limestone and other material used in the manufacture of cement. The incorporators are Messrs. William Bullock Clark; Samuel Shoemaker, Walter Crosby, all of Baltimore, Md., and George S. Schmidt of York, Pa. The plant of the company will be located in York county, Pa.

The Mohawk Portland Cement Co. of New York has authorized the issue of $150,000 first mortgage 20-year 6 per cent coupon gold bonds. The bonds are a first and only lien on the entire property of the company, including the real and personal estate, franchises and other property or afterwards acquired. It is stated that the property represents a cash outlay in excess of $400,000. A sinking fund is to be established to retire the bonds at maturity. The interest is payable semi-annually in March and September. C. F. King of Boston, Mass., is offering these bonds at $97.50, with an additional discount of 5 per cent from this price.

The Atlas Portland Cement Co. has been shipping from 30 to 35 cars of cement per day from its Hannibal plant.

At a meeting of the Glens Falls Portland Cement Company, Captain William W. Maclay resigned as president and general manager of the company, and has sold his stock and will retire from the concern. The company was organized twelve years ago by Captain Maclay and he has since been the active head. Captain Maclay was formerly an officer of the United States navy, having graduated from Annapolis in Admiral Schley's class. His future plans are not announced.

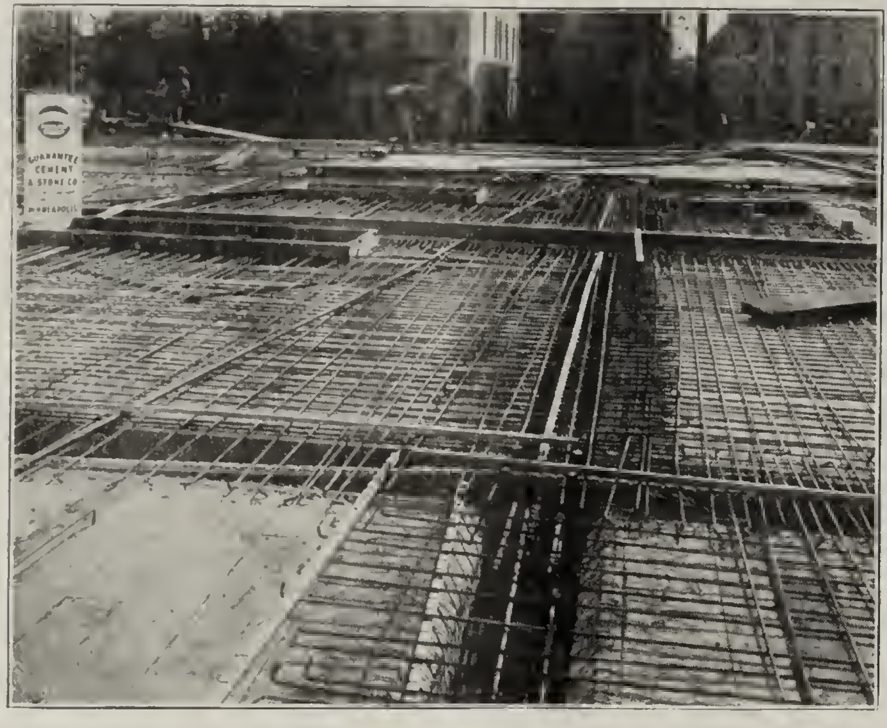
In the case of Remsberger vs. The Iola Portland Cement Co., in which the plaintiff sought to compel the company to remove its powder house from the vicinity of the plaintiff's property, the Iola company filed a demurrer to the evidence submitted and the case was dismissed.

The Lake Erie Cement Construction Co. of Norwalk, O., leased the Breckenridge farm and sand beach at Huron and will erect a factory there for the manufacture of cement building blocks. The land has been leased for twenty years, $50,000 being paid for the lease.

THE NORTHWESTERN KNITTING MILLS.

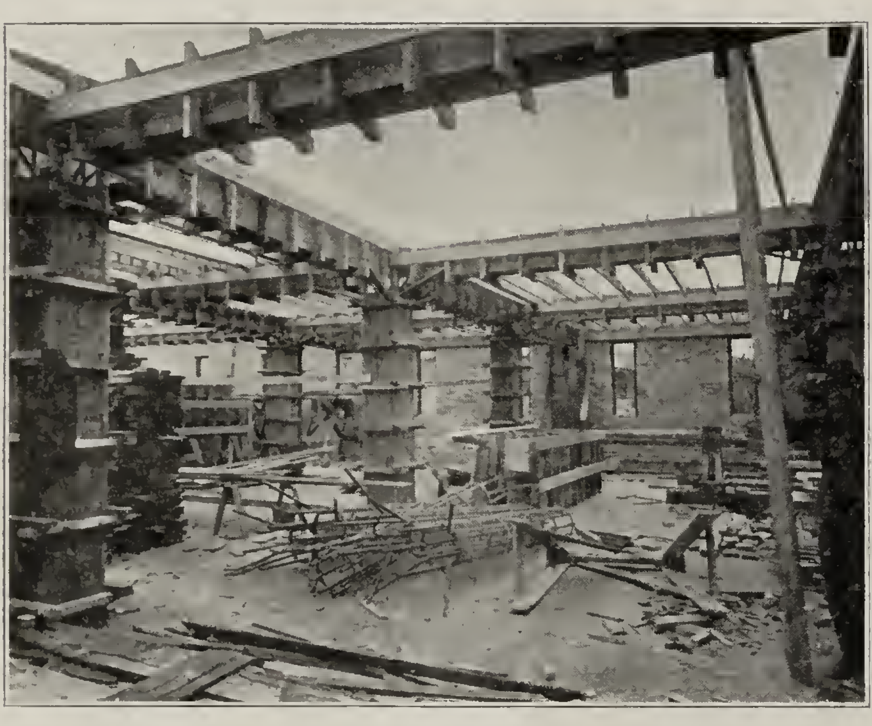
Reinforced concrete construction, Turner system. J. Wunder, Contractor; C. A. P. Turner, Engineer.

This building was constructed in reinforced concrete, under the C. A. P. Turner system, for the Northwestern Knitting Mills, and is located at Western Ave. and Syndate, Minneapolis, Minn. The building is 185 by 85 feet and three stories high and so constructed that two additional stories may be added. The floors were designed for loads of 500 pounds per square foot.


No. 1. Floor Reinforcement, Turner System.

The basement columns are 18 inches square, upper columns are 16 inches square, with all corners chamfered 3 inches. It will be noticed that this size is no greater than that used in steel and terra cotta fireproof construction.

All stairways are of reinforced concrete, arranged with fireproof partitions and doors, thus protecting each story from spread of fire should it start in the material stored on the floor below.


No. 2. Centering and Column Skeletons.

The roof is made similar to a floor, then a filling of cinders is applied to give the necessary pitch and a thin coat of cement on the cinder filling, covered with the usual pitch and gravel roofing.

All windows are of wired glass set in metal sash and frames. Foundation walls are of stone and above grade of brick. The vaults have solid concrete walls.

Fig. 1 shows the reinforcing members; round steel bar is in place on the false work for beams and floors, ready for the depositing of the concrete. This is mixed in the following proportions: 1 cement, 2 sand and 2 broken stone, pea size to that which will pass a ¾-inch screen being preferred. This mix is made sufficiently wet to flow slowly; such a mixture requires no tamping whatever.

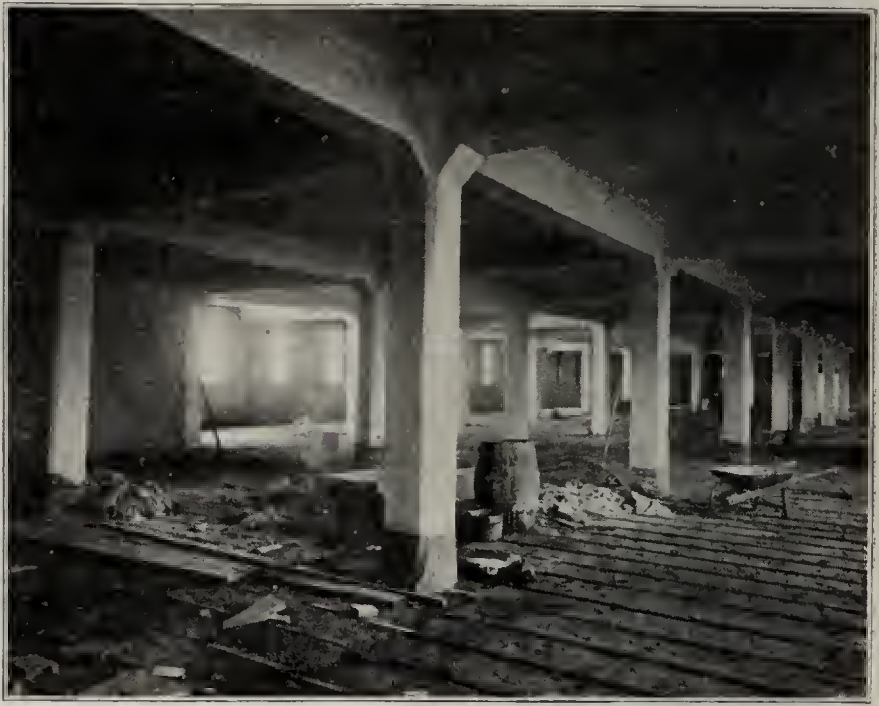
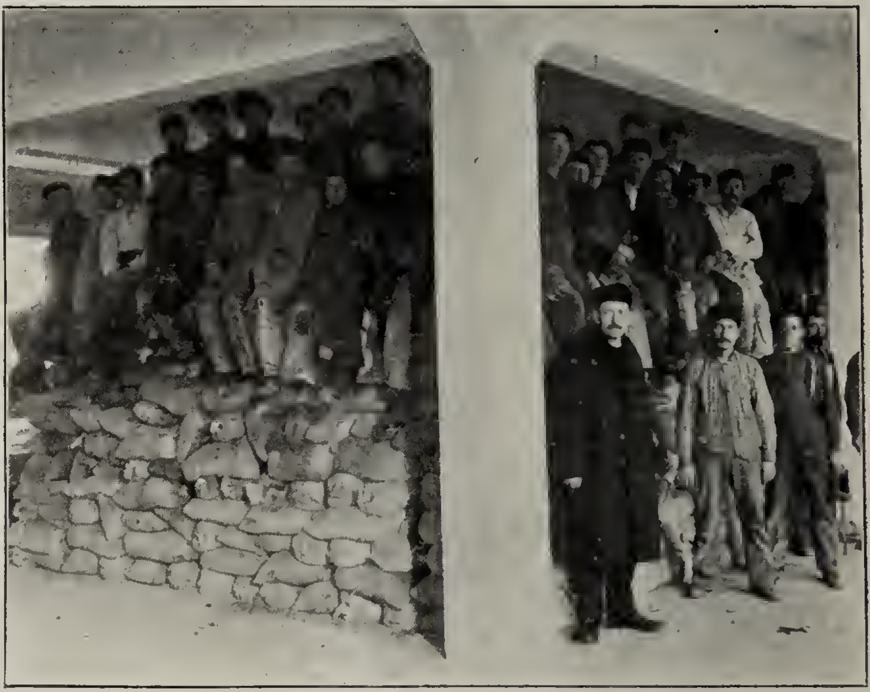

No. 3. Finished Columns, Beams and Ceiling.

Fig. 2 is a view showing the forms for columns and beams in position and the assembled skeleton column reinforcement ready to be placed.

Fig. 3 is a view of finished columns, beams and ceiling, with strip embedded in the floor to relieve the ordinary wood flooring.

Fig. 4 shows a test being made on a floor panel 16′ 8″ by 15′ 5″, the slab being 5¼″ thick, loaded with 100 tons of sand and the weight of sixteen men. The figure standing next to the column is C. A. P. Turner, C. E., of Minneapolis, who prepared the plans and superintended the erection of the structure.


No. 4. Floor Tests, on Panel 16′ 8″ by 15′ 5″, slab 5¼″ thick, under 200,000-pound load, besides the men. Deflection of beam, less than 1-16″; of slab, less than 3-16″ at center.

J. Wunder, of Minneapolis, was the contractor for the building.

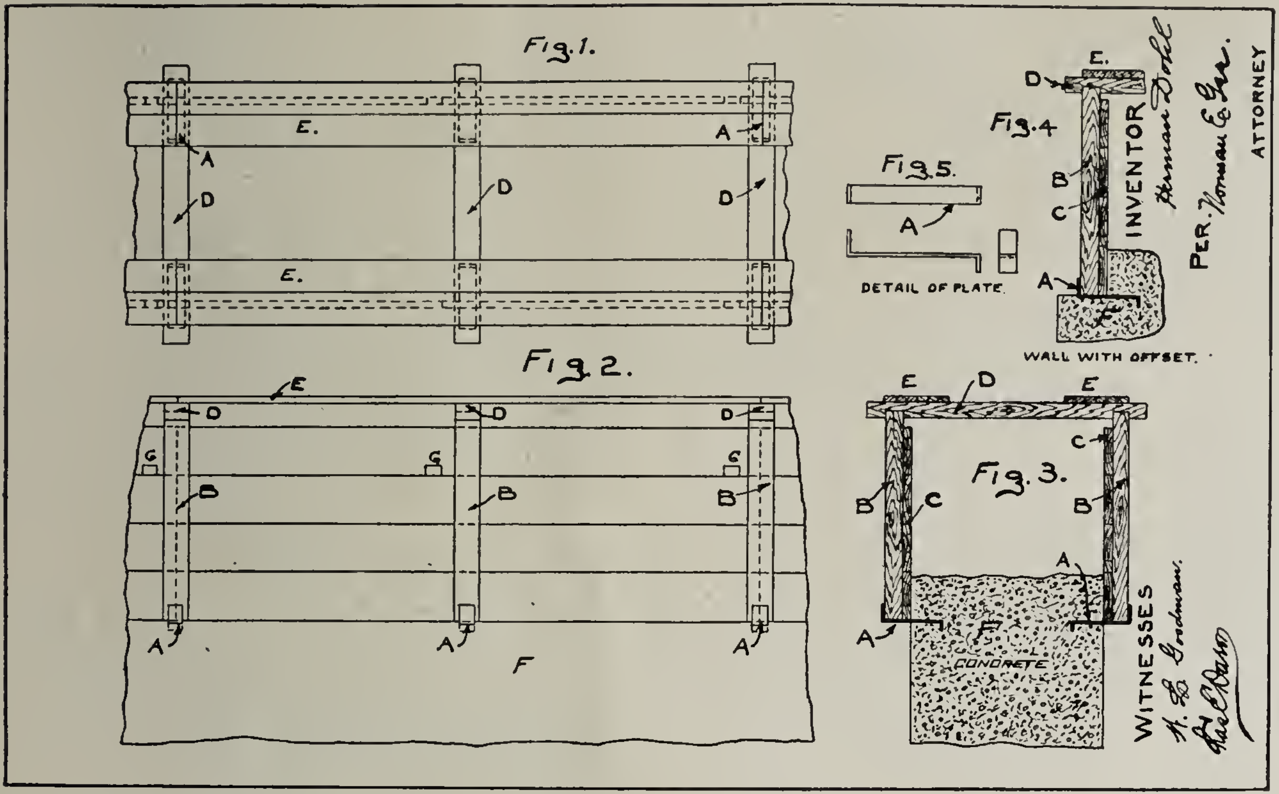
DOHL'S PATENT FORMS OR CASING FOR CONSTRUCTING CONCRETE WALLS.

The construction of monolithic concrete walls for buildings, dams and foundations usually requires much timber bracing, which requires time to erect and involves extra cost and labor, hence the use of the Dohl patent forms or casing provide a cheap, effective and improved method of constructing concrete walls without the use of timber bracing or shoring. In the accompanying drawing, Fig. 1 represents a plan view of a wall F under construction. Fig. 2 is a side view of the wall F, showing the supporting irons A, spaced along the wall, and retaining the upright posts B. Fig. 3 is a sectional view of the wall F, taken through the intermediate post B, showing the manner of placing the supporting irons A in a plumb wall, together with the binding piece D at the top, upon which is laid the running board E. Fig. 4 is a sectional view of a wall, with succeeding steps, as the wall becomes higher, showing the relative position of the parts, with reference to the supporting irons A. Fig. 5 is a detail of the supporting irons.

In constructing a plumb wall place a set of irons for each section, always leaving sufficient space while filling in to give the irons a sufficient body of concrete at the top, then fill in to the top of the casing and allow the work to set. Then remove casing from one set of irons to the other, continuing in this manner for each section. If necessary, when the wall is completed, irons can be cut off.

In constructing a wall as is shown in Fig. 4 fill in the casing to the top, setting the irons so they will be level with the offset as is shown in the figure, then set casing in irons just set. In a wall of this kind, the weight of the casing falls on the wall.

Further information relating to the use of these forms can be obtained from Herman Dohl and Daniel Dohl, South Bethlehem, Pa.



Concrete Core of a Dam Constructed for Westmoreland Coal Co., at Irwin, Pa., with the Dohl Patent Forms or Casing, Under Supervision of Chas. A. Hague, Consulting Engineer of New York City. In this piece of work there was not a timber brace or shore used.

The loss by fire of the Almendares Portland Cement Co., near Havana, Cuba, on Dec. 28, will be about $300,000, partly covered by insurance. This was the only cement plant in Cuba operating rotary kilns.

The capacity of the Round Top Cement Mill at Hancock, Pa., is being increased to 1,000 barrels of cement daily and a force of 60 men.

W. F. Kendrick, of Denver, Colo., president of the Crescent Land and Cement Company, has been buying up land in Jefferson county until he now controls 5,000 acres in and near Deer creek, six miles west of Littleton and seventeen miles from Denver upon which he proposes to build a cement plant, and build a railroad to connect with the Colorado & Southern, three miles from his property, the plant and railroad will cost in the aggregate about $300,000.

The Acme Cement & Plaster Co. of Acme, Texas, is erecting cement plaster mill which is to have a monthly capacity of 30,000 tons.

The Glens Falls Portland Cement Co. and the Burners' Union have settled the strike which has been on since last fall. The burners and their helpers accept a reduction of 25 per cent, while the common laborers go back at the former rate. Work will be resumed March 1st.

The title to the Mankato Cement Works at Mankato, Minn., has been passed from the Hartford Security Co. of Hartford County to Harry E. Carney of Mankato.

Bulletin No. 8 on the Cement Resources of Alabama has been issued by the state survey, edited by Eugene A. Smith, state geologist of Alabama.

The Nazareth Portland Cement Company, Nazareth, Pa., is making arrangements to double the capacity of its mills, the intention being to increase the output to 3,000 barrels per day. As plans are not completed the company is not yet ready to receive bids for the construction of the additional buildings.

THE JARVIS SYSTEM OF REINFORCED CONCRETE CONSTRUCTION.

This system of reinforcing concrete beams and columns has been patented in the United States by Beaumont Jarvis of Toronto, Canada. The invention consists of combining a number of flat steel bars increasing in length, located one above the other, and provided with end lips, the shorter bars being placed intermediate of the longer ones, stirrups with end lips, properly spared and set oblique, and inclined towards the end of the beam, as shown in Fig. 1.

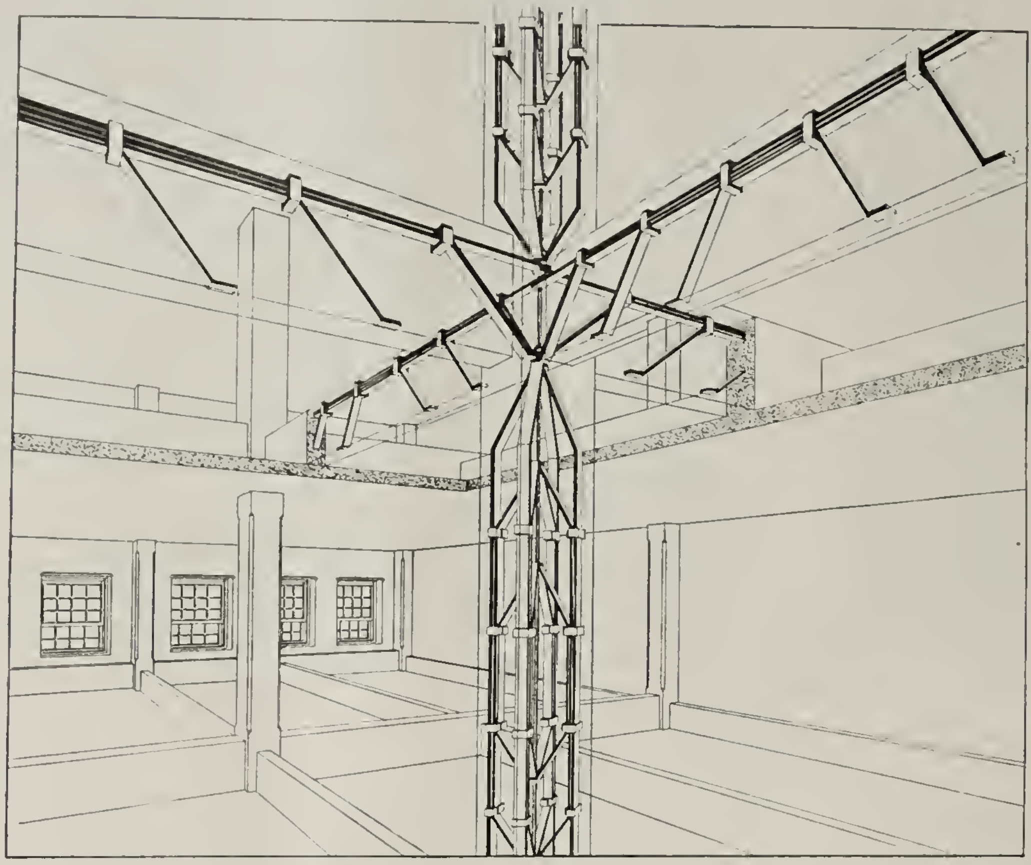


FIG. 1.

The column reinforcement is shown in Fig. 2.

It is claimed that at least 27 per cent of metal is saved in the arrangement and distribution of this bar over that of the Kahn bar, or by any other system where the rods do not diminish in proportion to the strain to which the beam may be subjected. In the Jarvis beam the cross section of metal is greatest in the center of the beam, where the greatest bending moment or tension of the truss is located.

The Expanded Metal Company of Toronto have purchased the Canadian rights.

George F. Boyle, formerly of Simpson, Crawford & Simpson of New York, has been elected President and General Manager of The Glens Falls Portland Cement Company, vice William M. Maclay, resigned. Mr. Boyle, who has acquired Captain Maclay's stock, was formerly manager of the New York department store of Crawford & Simpson. He is a native of Glens Falls and the founder of the Boston Store Company in this village. Leaving Glens Falls 12 years ago he went to Worcester, Mass., and later to New York. He returned to Glens Falls two years ago and has since been active in business.

INCORPORATIONS.

The Akron Gypsum Company, Akron, N.Y., object, to manufacture gypsum; capital, $200,000; directors, George J. Ralph, Irving D. Eckerson, James E. Paxon, Richard H. Bell of Akron, and Albert J. Hemmings of New York.

The Artificial Stone Company, of Spencerville, Ohio, capital $10,000. Clarence Hart, Jacob J. Gayer, James Cockran, J. K. Welch and John B. Post, incorporators.

Pettyjohn Co., Terre Haute, Ind., capital stock, $10,000. Object is the manufacture and sale of machines for making hollow concrete building blocks, and the manufacture and sale of other similar machines. Wm. P., Katherine M., Laren and Ethel R. Pettyjohn, incorporators.

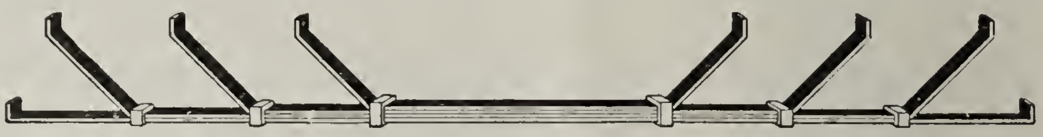


FIG. 2.

The Cement Block and Construction Co., Neola, Iowa; capital, $5,000. J. T. Mitchell, J. H. Cupp, E. F. Cotter, A. T. Barnes and A. E. Pierce, incorporators.

Leonard Martin Construction Company, Chicago, Ill.; capital, $10,000; contractors and engineers; incorporators, Walter I. Martin, Frank A. Helmer, Louis Grollman.

Greenville Concrete Stone & Construction Co., Greenville, Iowa, capital, $2,100. W. B. Bradsby, Ed. DeMoulin and C. A. McCracken, incorporators.

Inman Concrete Building Block & Machine Co., Beloit, Wis.; capital, $5,000. C. E. W. Inman, O. D. W. Inman, and C. S. W. Inman, incorporators. Object, manufacture and sale of building blocks and machines for same.

Missouri Lime and Cement Company of New Jersey, located at Kansas City, Mo.; capital, $50,000.

Concrete Stone Co., Ida Grove, Iowa; capital, $15,000. Object, to buy and sell cement. Jos. J. Smith, Wm. R. de Vries, Chas. A. Britch, H. A. Dessel, J. W. Reed, incorporators.

National Cement & Plaster Co., Parkersburg, W. Va.; capital, $15,000. S. T. Mallory, C. J. Van Valley, T. F. Woodyard, Simms Powell, S. Keenan, R. Brown, and Thos. Garthan, incorporators.

The Moores-Coney Company, of Cincinnati, Ohio, $100,000. R. H. Coney, W. W. Coney, F. Lawson Moores, Harlon Cleveland and H. T. Loomis, incorporators. Objects, to make lime, cement, tile floors and builders' supplies in general.

The National Concrete Company of Indianapolis, Ind.; capital, $100,000. Objects, to manufacture cement, mine and concrete work of all kinds. E. H. Lee, J. C. Stuckenburg, Russel T. McFall, directors.

The Coshocton Wall Plaster and Cement Company, Coshocton, Ohio; capital, $10,000. M. I. Leffier, U. G. Rolston, I. J. Murphy, George W. Mullen, S. B. Dawson and E. S. Curtis, incorporators.

The Cement Block and Construction Company, Bellefontaine, Ohio; capital, $20,000. Sam A. Buchanan, Charles W. Wegmouth, J. H. Wilson, Lewis S. Horn and John E. West, incorporators.

H. S. Seabright Co., Wheeling, W. Va.; capital, $25,000. Objects, to manufacturing building blocks, plaster and kindred materials. Henry S. Seabright, H. J. Hoburg, R. M. Gilleland, Chas. H. Seabright and H. A. Nolte, incorporators.

Meyer & Fostevin, New York City, N. Y.; objects, manufacture cement floors, etc.; capital, $10,000. I. J. Meyer, C. LeP. Fostevin, T. A. Meyer, New York City, incorporators.

Ralph Storm & Co., Waterloo, Ia.; capital, $60,000. Object, to manufacture cement blocks.

The Bridgeport Concrete Co., Bridgeport, Ohio; capital, $10,000. J. C. Heinlein, Fred Neininger, Joseph McConnaughy, incorporators.

Concrete Plant Manufacturing Co., New York City; object, concrete supplies; capital, $5,000. F. Dedek, Bellmore, N. Y.; J. Schemer, Brooklyn; T. H. Knapp, New York, incorporators.

The West Liberty Concrete Company, Garner, Iowa; capital $10,000.

Alamo Cement Company, of San Antonio, Texas; capital, $10,000. Dr. Fred J. Kalteyes, Charles Baumberger, F. W. Cook, Albert Kronski and Nic Belkes, incorporators.

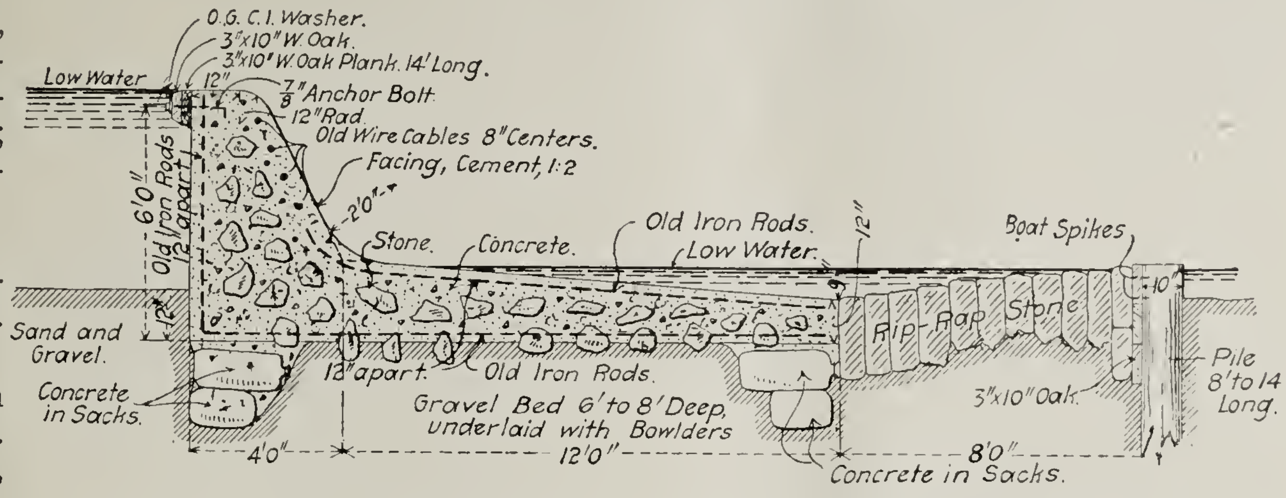
Practical Cement Block Company, Indianapolis, Ind.; capital, $20,000. Will H. Whittaker, Arthur E. Bradshaw and William H. Johnson, directors.

The McArthur Clay and Cement Block Manufacturing Company, McArthur, Ohio; capital, $50,000. F. E. Mohr, Jack Thompson, J. M. Moore, C. B. Wescoat and John H. Best, incorporators.

The Cast Stone Construction Co., Bozeman, Mont.; capital, $10,000. Objects, to manufacture cement and cement blocks. J. A. Hall, Peter Vreeland, J. H. Dawes, W. A. Roland and W. M. Carpenter, incorporators.

CONCRETE DAM AT RICHMOND, IND.

Sir:—In Vol. 50, page 666, of The Engineering Record, is given the cost of a low dam at Manchester, Ia. It states the cost was about $2.50 per cubic yard. There was 1 1-3 bbl. of cement used per cubic yard of concrete, and about 1 1-10 yd. of gravel, and at the price given for these two articles the cost would be $2.56 per cubic yard; labor, forms etc. (as per contractor's bid), $2.50, which would make $5.06 per cubic yard. I think it would be well when giving accounts of this kind of work to state the price in terms of cubic yards of masonry in place, and give the cost of each class of labor in same unit, something like I have endeavored to do in the following. By doing this it makes the article of value to the engineer, and while not a criterion to go by in other cases, it is a great help, for we all know each individual case presents its own characteristics. Many articles are so incomplete that they are misleading, therefore of little value, and people who read them, not being acquainted with this class of work, are apt to look with suspicion on those who do this kind of work when they ask from $5 to $8 per cubic yard for the same.



I enclose you a blue print of a low dam I built for the Richmond municipal light and power plant, between the old abutments of the old National bridge over Whitewater river at Richmond, Ind.:

Cost of dam proper, 220 cu. yd. at $5.58	$1,227.60
Cost of reinforcing old abutments and extra foundation, 87 cu. yd.	485.46
Driving 44 16-ft. piles	320.00
Riprap masonry, labor (stone free), 53.5 yd. at $0.80	42.83
Gates for spillways and fish ladder	25.00
Total cost	$2,100.89

The cost of gravel and stone was 80 cents per cubic yard, for each cubic yard of concrete in place; the cost of pumping, 27.5 cents, for each cubic yard of concrete in place; the cost of lumber, 60.8 cents, for each cubic yard of concrete in place; the cost of cement, $1.485 (cement $1.60 per bbl.), for each cubic yard of concrete in place; drift bolts, I-beams and incidentals, 44.5 cents, for each cubic yard of concrete in place; labor, excavating and placing coffer dam, 96 cents, for each cubic yard of concrete in place; concrete and frames, $1.007, for each cubic yard of concrete in place. Total cost, $5.58 per cubic yard.

In excavating it was found that the bed of the stream was entirely composed of, first, sand from 1 to 2 ft., then gravel 2 to 4 ft., then gravel mixed with boulders and some clay 6 to 8 ft. The sand was a clean washed sand, as was the gravel, and was mostly used in the concrete. The sand and gravel was removed around the edges of the dam down to a point where compact gravel was found, upon which concrete was deposited in large sacks containing about 3 cu. ft. each, when in place, filled in and around with concrete. Upon this foundation the dam was constructed as shown by cross-section. Atlas Portland cement was used, one barrel per cubic yard of gravel; the gravel containing the sand. The concrete was mixed what I term wet. Large clean stone was placed upon the subgrade and wet, the concrete then deposited over them to the depth of 6 in., and then another layer of stone placed upon the concrete and settled to place with a rammer.

No stone was nearer to another than 4 in. This operation was repeated until the forms were filled. Around the edges a straight shovel was used to chop the concrete down and work the fine material out next to and the coarse back from the templets. On the face of the dam, facing mixed in a semi-dry state was placed next to the forms, backed with concrete and thoroughly tamped as the work progressed. This facing, like the top of dam and top of apron, was mixed one cement and two sand.

It was necessary to build coffer dams around all this work, and to keep a 4-in. centrifugal pump, operated by a steam engine, constantly running to keep the water down.

The dam was built in alternate sections of 14 ft. each; the spillway was built first at the east end, provided with two open ways 3x3 ft., then the opposite end. When the last section of 28 ft. was put in, the water in the stream was turned through the opens ways, which kept the water below the top of the dam while the last section was being built.

The dam is 120 ft. long, and three tons of old scrap iron rods and cable was used to reinforce it.

The long apron, pile and rip-rap. was built to prevent the high water from washing out in front of the dam. The iron rods was used to reinforce the work, and prevent breaking up of the apron in case a washout would occur. The section of dam is peculiar and shows what engineers will resort to under existing difficulties that could not be removed, but must be overcome. Time will demonstrate the success or failure of this piece of work.

Yours very truly,
H. L. WEBER,
City Engineer.
Richmond, Jan. 14.

UNDERWRITERS AND CONCRETE.

The National Fire Protection Association has appointed a committee on cement for building construction which will, we hope, do full justice to the subject. In this connection we reproduce an editorial from Insurance Engineering:

"UNDERWRITERS' INJUSTICE TO CONCRETE.

"It is beyond question that the framers of the Universal Mercantile Schedule were unbiased in reaching their conclusions with regard to the materials best adapted to fireproof construction. The expression in that document in favor of hollow tile as against concrete as a method of fireproofing was probably not due to any belief on their part in the inherent and invariable superiority of the former—but rather to the fact that, prior to and at the time the schedule was prepared, monolithic construction, while showing excellent results, had not averaged as well as the hollow-tile system, owing to the inexperience, carelessness or worse faults of some of its exponents. But progress is possible and natural in most things, and concrete construction has made great forward strides in recent years. The best engineering thought in the United States and abroad is now convinced that concrete is to be the predominant building material of the future. The development in this direction within five or ten years has been tremendous. The result is a thoroughly developed science whereby the performance of any combination of materials and method under the stress of fire and load can be predicted almost to a mathematical certainty. It is quite within the bounds of observation and reason to say that good concrete construction is certainly the equal of good hollow-tile construction. That being the case, should not the underwriters' schedules be amended to correspond with the demonstrations of to-day? Both types of construction, hollow tile and concrete, suffer occasionally, owing to the incompetence or fraudulent acts of contractors; excellence in either type is dependent on the utilization of good materials and the exercise of care. Concrete construction is so logical, and admits of such varying application, that its future is assured. If fire insurance schedules are to be considered logical, the present inequality of rating cannot long be maintained. What is most needed in this country is a better supervision of both systems in all their stages and more care on the part of municipalities and underwriters in the approval of "systems." It is, of course, impossible to supervise minutely every detail of every job; but the practical result can be accomplished by limiting the permission to construct to such concerns as see to it that their own reputations are kept in repair. In the matters of specification and supervision the Europeans are far ahead of us. As an example, we give the gist of some German specifications for the preparation and installation of a prominent type of steel-concrete construction:

"'In order to undertake any work in this system, the special authorization of the inspectors of buildings must be obtained. The request must be accompanied by copies of the plans, static calculations, and an account of the properties and composition of the materials to be employed. The authorization will, in general, be granted upon the following conditions:

"'1. The execution of work shall only be confided to experienced workmen, who shall be under the superintendence and permanent control of a trustworthy manager who must be able to prove, by means of certificates, that he has a perfect knowledge of the system in question.

"'2. The concrete must be composed of a good brand of cement, sharp sand, and gravel. The proportions of the mixture are to be such that the resistance of the concrete to crushing shall not be less than 2,062 pounds per square inch after hardening for 28 days. The resistance to tension, i. e., the tensile force at which the concrete breaks, must not be less than 550 pounds per square inch. The admitted force to compression must not be less than 412 pounds per square inch.'

"There are reasons for believing that the most advanced insurance engineers hold opinions similar to those expressed in the foregoing and have held them for some time. In a recent letter a gentleman occupying a high position in the scientific branch of the fire insurance business commented on the enlightened position the underwriters have now taken in these words: 'The chief objections to the use of concrete in building construction, especially its use in connection with floor arches, has always been the danger of unreliable proportioning and mixing of the ingredients, and the danger of constructing the floor arches during freezing weather. If it is expected that underwriters will not continue to regard concrete construction with considerable doubt, it is quite essential that these two important objections should be largely removed or minimized. It is somewhat encouraging to see that some progress is already being made toward the adoption of standards governing the quality of the material, its proportions and methods of mixing.'

HOLLOW TILE VS. CONCRETE.

"From time to time inquiries have been received from architects asking the reason for the discriminatory charge in fire insurance schedules against systems of concrete floor construction as compared with systems of employing hollow tile. In every instance the inquiries have been forthcoming for the reason that, in the experience of the writers, the justice of discrimination is not borne out by the comparative performances of the two types under fire tests. In explanation of the discrimination, the Universal Mercantile Schedule (used in a more or less modified form in nearly all parts of the United States) says: 'The best fire arch is the old-fashioned brick segmental arch properly bonded. It will successfully resist the passage of flame and heat. Tile arches of well burned clay rank second to brick, but are not equal to brick arches, because of the difficulty of properly laying them, which involves the danger of carelessness and indifference on the part of the masons, and because of the danger of fractures. Some of the patent floor arches are good in their way, but none of them is equal to brick or tile.' The old-fashioned brick segmental arch has probably a higher resistance to fire than any other form of construction, but its extreme weight practically prohibits its use. The hollow-tile arch, as it is ordinarily built, flat in form and of side or end construction, depends upon many conditions to insure its accomplishing the best results. It must be set by masons skilled in this particular branch of work; all angles made by the supporting girders must be right angles and the space between the girders must approximate very closely the span for which the arch was designed; the lips on the skewbacks, intended to protect the under surfaces of the girders, must be very thick in order that they may not be broken in handling; none but entirely unbroken blocks should be used, and great care should be taken to cover thoroughly the surface of the girders with cement mortar before the blocks are applied. The rules of masons' unions all over the country require that hollow tile shall be laid by brick masons, not necessarily workmen of experience, but by any who make application when the work is to be done. As a rule, girders make right angles, and are so spaced that the tile arches fill nicely, but not infrequently quite the opposite is true. The lips on the skewbacks are almost invariably thin and the blocks brittle, causing them to chip and crack on small provocation, while practice has shown that it is very difficult to secure care in the covering of girders with mortar. The results of these untoward conditions are the patched and uneven surfaces of tile floor arches so often seen in buildings under construction as well as the rusting of metal thus encased, instances of which were found in demolishing the Pabst hotel. The flexibility, ease of erection, efficiency under fire and load, protection against corrosion, and greater probability of uniform results, as embodied in the better class of monolithic systems, have already won full recognition for this type of construction in the architectural profession. Underwriters, however, still cling to a belief in the invariable superiority of hollow tile.

"Again, it may be said that there are reasons for believing that the most advanced insurance engineers hold opinions similar to these and have held them for some time. The lack of action by underwriting bodies on the question of concrete construction has embarrassed architects and builders, and even underwriters themselves, but happily, this deficiency is shortly to be remedied.

ACTION OF OTHER NATIONAL BODIES.

"The American Society of Civil Engineers has appointed a 'Committee on Concrete and Steel Concrete' and the American Society for Testing Materials has a 'Committee on the Subject of Cement.' In addition, the work of the Insurance Engineering Experiment Station at Boston and the New York Department of Buildings along this line is deserving of mention. Professor Charles L. Norton of Boston and Professor Ira H. Woolson of New York have made valuable contributions to the available data on the subject of reinforced concrete as a form of fire-resistive construction for buildings, as has also Professor Talbot of the University of Illinois. This united action should result in a definite and satisfactory knowledge of the properties and merits of cement construction and in the formulation of reliable standards of specifications.

ITS POSSIBILITIES AND FIRE RECORD.

"The possibilities of reinforced concrete are unmistakably demonstrated by such buildings as the Pacific Coast Borax Factory at Constable Hook, N. J., the United Shoe Machinery Works at Beverly, Mass., the Foster-Armstrong Piano Factory at Despatch, N. Y., the Bilgram Machine Shop at Philadelphia, Pa., the Ingalls Building at Cincinnati, O., etc.

"The successful fire tests of reinforced concrete and the experimental tests conducted in New York City and Boston seem to afford almost conclusive evidence of the merits of this type of construction; hence it may be said that it is entitled to the same consideration that is given to any other standard construction."

A CEMENT COMPANY IN TROUBLE

The Continental Cement Co., who have a plant at Cassadaga, are in trouble. Foreclosure proceedings are now being carried on which will probably result in the public sale of the property.

The property is valuable being worth in the neighborhood of one hundred thousand dollars. There are one hundred and fifty acres of real estate containing deposits of marl, used in the manufacture of cement.

There is also enough peet to furnish fuel for years and it is understood that gas is also abundant on the property. The buildings are valued at about fifty thousand dollars.

The financial difficulties of the company have been multiplying of late. A mortgage of $20,000 collateral to a bond issue will have to be satisfied first at the foreclosure sale.

Men who have been employed by the company have secured a lien on the property through their attorney, T. P. Heffernan of Dunkirk, for $2,000 pay due them. Some of these men worked nearly six months without receiving a cent. Attorney Heffernan has also secured a lien for the Grey Iron and Steel Co., of Cleveland, for a steel roof. A Falconer concern has another lien.

Besides these, Warner & Farnham have secured a mechanic's lien for Peter Meister & Son, of Dunkirk.

This cement company was originally organized by Frank E. Shaw of Moons in the early nineties. He erected buildings and operated the works for a few years. Later the company was reorganized by Dunkirk people, who turned it over to John H. McLauchlin of Owen's Sound, Canada, and an associate, about two years ago, who are now the principal owners.

A prospective Mexican order for 65,000 barrels of cement was lost to the American producer on account of rates in excess of $1.65 per ton from Atlantic ports to Vera Cruz, Mexico. Extensive water works projects in Mexico City and other inland towns call for hundreds of thousands of barrels of high grade cement. The contracts for these enterprises are held by German concerns and the present order calls for 240,000 barrels. Of this quantity, 165,000 barrels were to be high grade, and an American cement of the grade required could have been delivered f. o. b. steamer at an Atlantic port cheaper than the same grade of German cement f. o. b. Hamburg. The rate of freight to Vera Cruz was therefore the determining factor, and one of the large German steamship companies has contracted to transport the entire quantity of 240,000 barrels at a rate sufficiently low to secure the order for German manufacturers.

Articles of incorporation of the Mobile Concrete and Building Block Company, Mobile, Ala., were filed in the probate court, the incorporators being W. A. Shriner, John A. Stikes, Thomas F. Costello, C. F. Cullen and Harvey D. Milburn, all of this city. The company proposes to manufacture houses of hollow concrete blocks, build cement walks, curbing, artificial stone work and do a general business in cement and concrete. The stock is placed at $10,000, of which 40 per cent has been paid in.

The officers are John A. Stikes, president; Thomas F. Costello, vice-president and secretary; W. A. Shriner, treasurer; C. F. Cullen, general manager. The plant will be erected at Crichton, this county.

The Canadian Bureau of Mines is in receipt of an inquiry from London, England, concerning Portland cement. The writer says a combine practically exists in Great Britain, and he asks if the Canadian material could not be shipped thence. It is thought at the bureau, however, that the price he mentions, 20 shillings ($4.80) a ton, would hardly pay Canadian manufacturers.—Toronto Globe.

Business Manager.—Cement man with 15 years' experience in this line, abroad and in United States, will shortly be open for engagement as business manager, treasurer or similar responsible position. Can furnish first-class references. Address "Business Manager," care of Cement and Engineering News, 162 LaSalle St., Chicago.

The Practical Cement Block Co., Indianapolis, Ind., has incorporated with $20,000 capital stock. The company is in the market for cement machines to make posts, railway ties and building blocks. A. E. Bradshaw is president.

The City of Vienna, Austria, has decided to erect a Portland plant. The city expects to make all the cement for its own public works. The New Kintell prices of the Austrian Cement Combine forced the city to erect its own plant.

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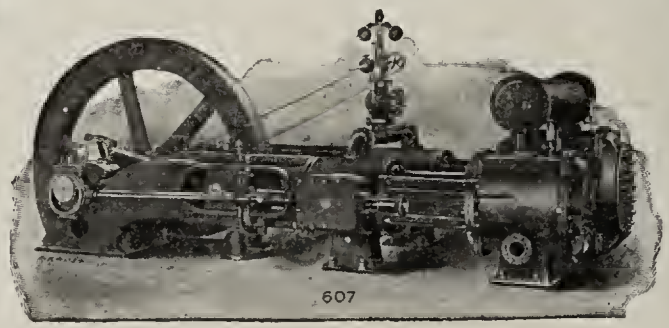

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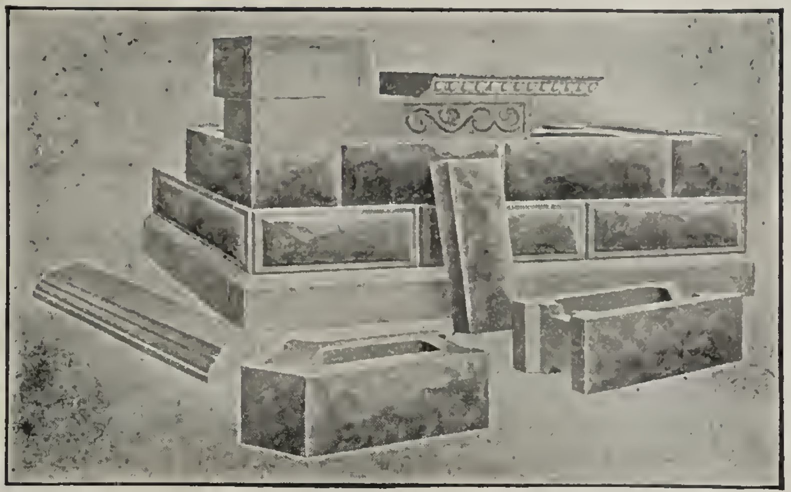

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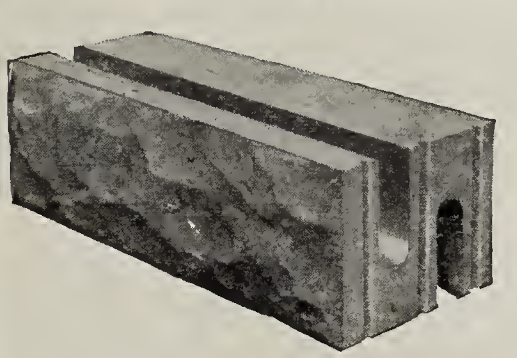

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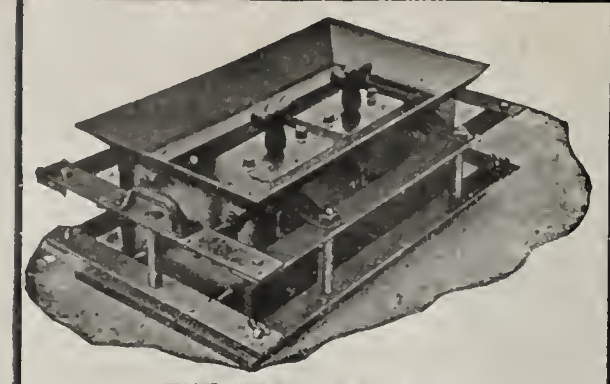

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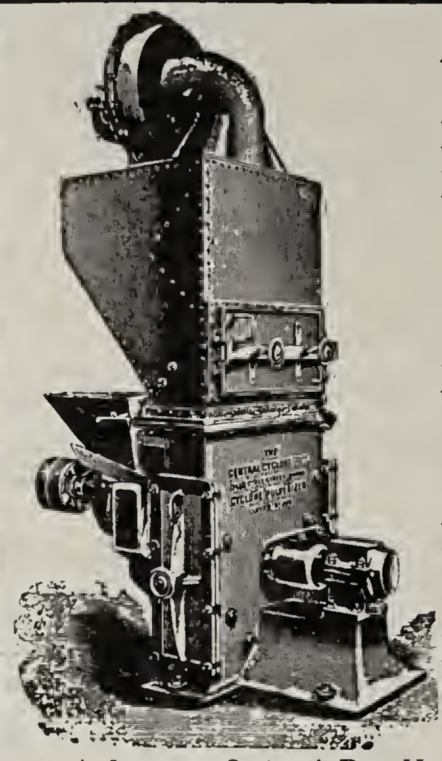

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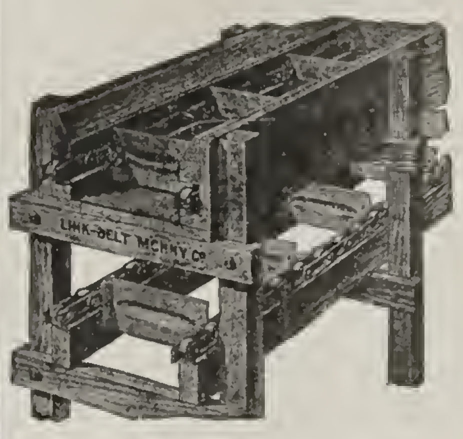

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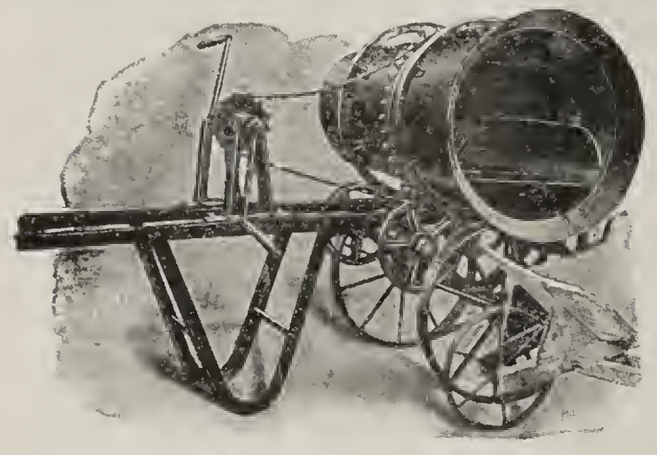

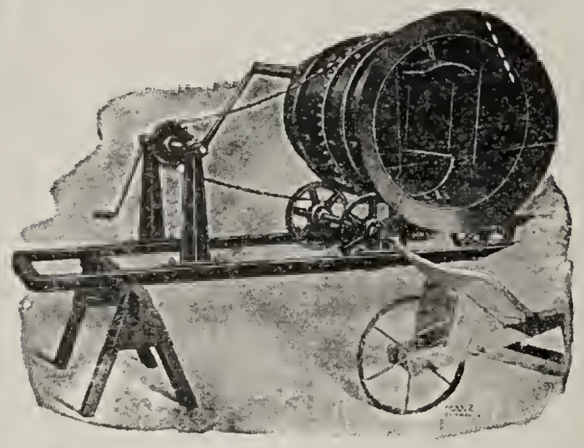

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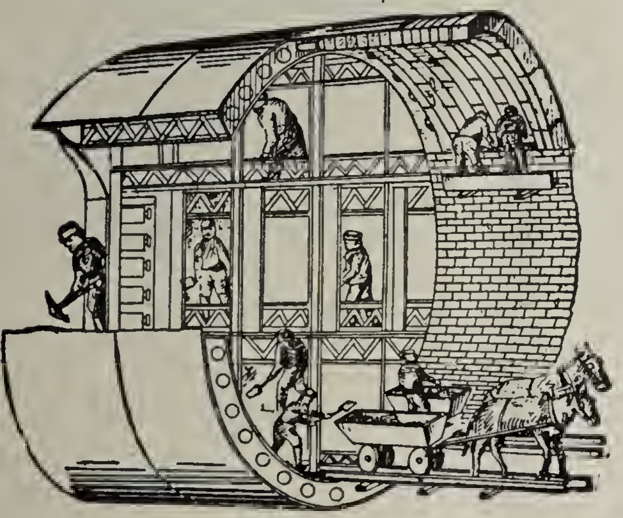

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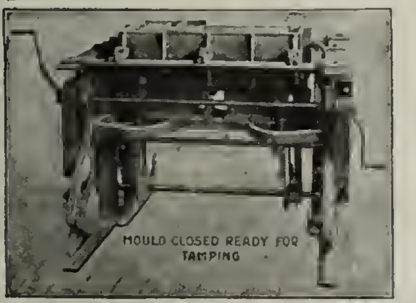

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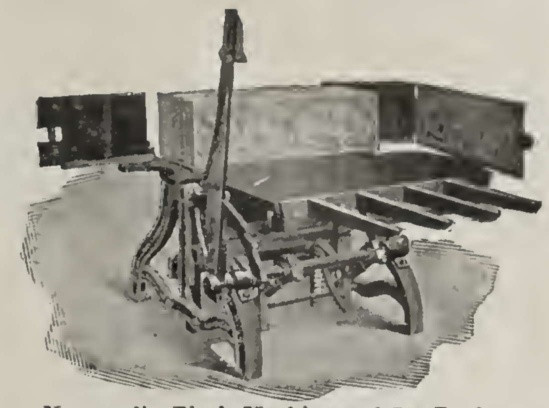

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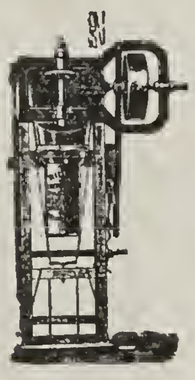

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The United States Circuit Court for the Western District of Kentucky, at Owensboro, June 2, issued an injunction against Spayd and Bennett, restraining them from making or selling any machine or apparatus for making building blocks embodying or employing the inventions and improvements made and claimed by H. S. Palmer, in patents Nos. 375, 377, Dec. 27, 1887, 623, 686, April 25, 1899, 727, 427, May 5, 1903 and 727, 428, May 5, 1903.

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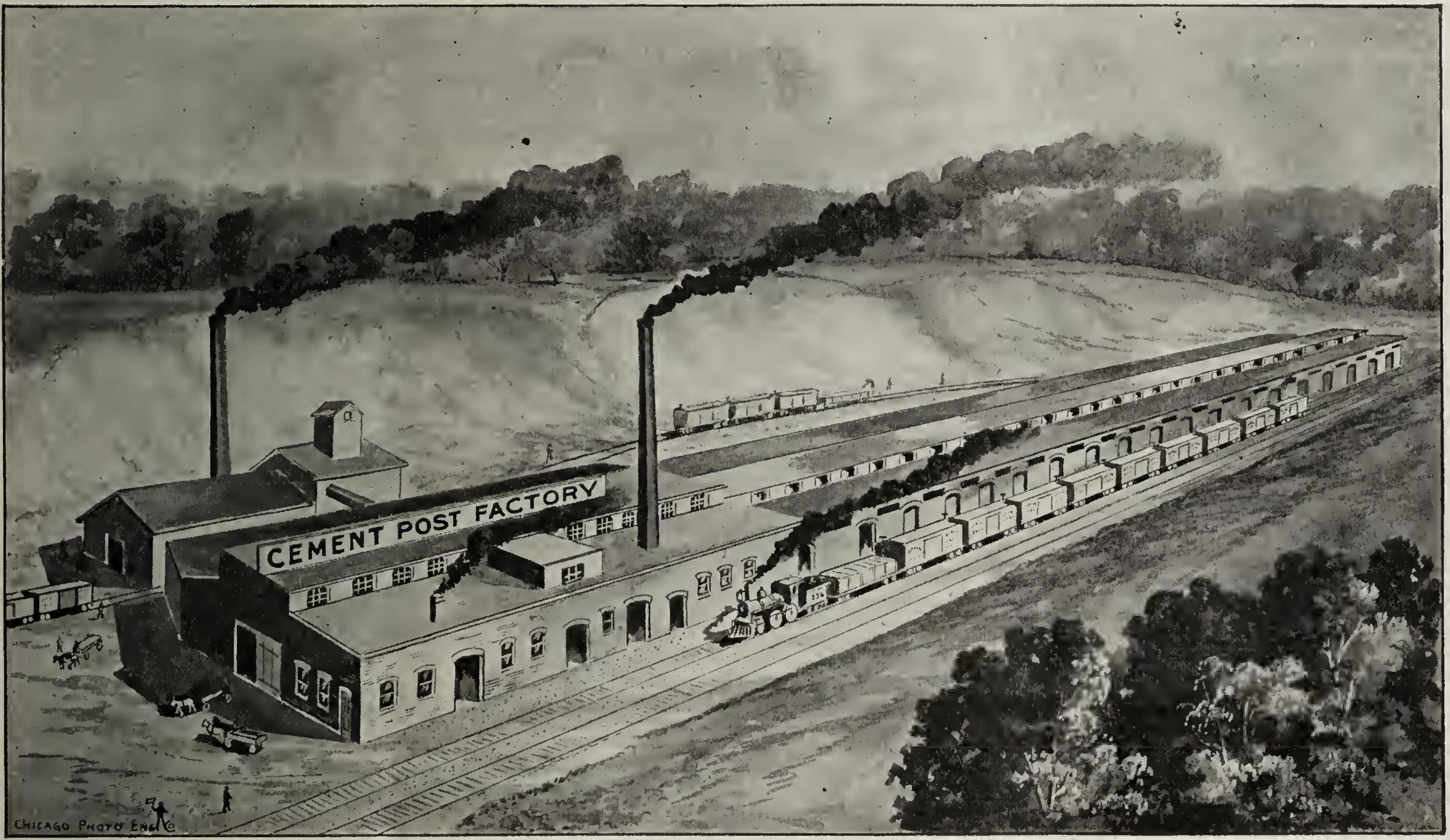

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CHICAGO, APRIL, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

CEMENT BRICK.

The extraordinary growth of the cement building block industry during the past three years has developed almost the united opposition of the brick industry. The brick manufacturer and bricklayers' unions, in large cities, have influenced legislation against the hollow concrete block, requiring a 16-inch wall for the block, where a 12-inch brick wall will pass inspection. The entire adverse legislation being founded upon political pull. In short, graft ordinances, under which a brick having a compressive resistance to fracture of from 363 pounds down to 90 pounds per square inch will be received, while a cement block mixed one cement to four and one-half sand and gravel will develop a resistance of 2,750 pounds per square inch in 30 days and 3,750 pounds per square inch in one year. Yet the concrete block wall must be laid four inches wider than the brick wall. This simply shows how common sense can be overridden by political pull and the substantial interests of entire communities subordinated to the selfish personal interests of a particular set of men, such as the clay brick manufacturers and brick layers' unions. In order to overcome these graft ordinances we are in favor of the use of cement brick in large cities, where millions of them can be marketed; these brick can be made at a lower cost than burned clay brick. Pressed cement brick of a high grade, which bring $18 per thousand, are now in the Chicago market. They sell readily and are preferred to the clay brick. One cement brick mixed 1 to 15 and compressed on very heavy machines are finding a good market at $15 per thousand. Strange to say the bricklayers' unions do not object to laying these or other cement brick; they handle them as readily as they do the burned brick. When people become familiar with cement brick it will follow as a matter of course that the cement building block will be received with equal favor by reason of the greater economy in the use of the hollow concrete block. Therefore, do not give up the block; investigate cement brick machinery and take up the cement brick as a side line. It will pay. They can be used for partition walls. Cinders being used instead of sand and gravel. In Germany a great industry has been built up in a cheap brick known as Schwammstein brick, made of a porous volcanic rock and hydraulic cement. They are used for partition walls, being light and not over strong, yet answer every purpose for partitions in the best dwellings. One-story cottages are built of this brick. They are very porous and need the protection of overhanging roofs, unless plastered with Portland cement mortar.

INSURANCE RATE ON CONCRETE BLOCK CONSTRUCTION.

Fire insurance companies have heretofore been rather slow in making proper rates on cement building block constructions. Everything has been at sea in this line of risks. The lack of proper data upon which rates should be based has been the hinderance to the fixing of a just and equitable rating on this new method of building construction. The entire subject is now in a fair way of being settled in short order.

The underwriters have been flooded with applications for rates. One general supervising insurance agency has been receiving on an average 45 letters per week from local agents in the west asking for rates, and so pressing have been these demands that a rate is to be made at once. The entire matter has been held in abeyance in the past, awaiting the report of the staff of engineers now in the field collecting data for the Committee of Twenty appointed by the National Board of Fire Underwriters, who assume entire charge of the matter, covering not only cement building block rates, but various other pertinent questions relating to the reduction of fire hazards generally. The loss of time depending upon the report of the above named committees and the engineers has impelled certain general insurance agents in Chicago to fix a rate independent of the National Board, which will be about the same as brick. This is the first definite step in the right direction and will be a boon to the cement building block industry.

RESTORING DECAYED LIMESTONE.

The walls of Westminster Abbey, London, have undergone considerable decay. The sulphuric acid liberated by the combustion of coal having attacked the limestone of which they are built converting the carbonate of lime into sulphate of lime. The abbey walls have now been recarbonated by the application of a solution of barium hydrate which was sprayed onto the inside and outside surface. The barium wash was mixed 5 oz. barium hydrate to each gallon of water. The wash was applied at intervals, which brought the stone back to its original hardness and density. The same wash should be very beneficial applied to the hollow concrete building blocks to give them greater density and consequently higher waterproofing properties.

C. W. Dol will erect a sanitary market of reinforced concrete to cost from $18,000 to $20,000 at Big Rapids, Mich., to conform to plans suggested by W. G. Ward, who will lease the building. The interior of the building will be so constructed that it may be washed down daily with hose from the city water supply.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom	2,240,000	7,381	....	....	40,274,392	127,700	6,997,424	22,910
Belgium	13,291,481	39,095	8,864,935	27,238	154,069,638	463,045	115,205,598	377,677
France	2,659,255	8,522	....	....	6,266,940	23,659	5,511,299	21,713
Germany	9,216,846	27,731	4,234,617	16,086	274,072,128	933,392	153,705,184	519,375
All Other Europe	1,367,237	4,118	....	....	4,896,692	13,650	1,226,901	4,219
British North Am.	4,560	26	....	....	892,715	4,162	144,915	763
Other Countries	2,398	8	2,000	10	3,263,448	13,263	1,871,264	7,166
TOTAL	28,781,797	86,881	13,101,552	43,334	483,735,953	1,578,871	284,662,585	953,823
Domestic Exports of Cement, bbls.	11,618	21,911	38.102	56,710	200,002	303,726	669.687	959,252

There were 15,269,788 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in February, 1904, valued at $51,510, against 13,450,678 lbs. valued at $43.032, in February, 1905.

Imports of asphaltum or bitumen for February, 1904, were 4,676 tons, valued at $21,175; February, 1905, 4,437 tons, valued at $11,921. For eight months ending February, 1904, 115,155 tons, valued at $354,590; for eight months ending February, 1905, 80,296 tons. valued at $353.933.

THE RUSTING OF STEEL BEDDED IN CONCRETE.

In the tenth annual report of the Boston Transit Commission the following account is given of two experiments for the purpose of determining how the rusting of iron or steel is affected by concrete:

To Indicate Whether Iron Rusts When Imbedded in Concrete.

Nine strips of sheet iron (2x6 inches) were cleaned till their surfaces were bright and free from rust. Then they were imbedded in concrete, molded into the form of a hollow cylinder, the outside dimensions of which were 14x20 inches, the walls being 3 inches thick. This cylinder, when hardened, was kept filled with water, and was placed in the tunnel. At first the water percolated through the concrete very readily, but the amount of percolation gradually diminished so that at the end of about two months the cylinder became practically watertight. At the end of two years the sheet iron strips were removed from the concrete and examined. They were found to be free from any rust, and in as bright condition as when placed in the concrete. The concrete was made in the proportions of 1 barrel of Portland cement, 9 cubic feet of stone dust and 11 cubic feet of broken stone.

To Indicate Whether Steel Imperfectly Cleaned Is Preserved From Further Rusting by Imbedding the Same in Concrete.

A square plate (4x4x½ inch), which had become badly rusted, was cleaned by filing till its general surface was bright, but the rust still remained in the numerous small pits. This plate was then surrounded by about 1½ inches of concrete, molded in the shape of a square block. The concrete was proportioned as follows: One barrel of Portland cement, 9 cubic feet of stone dust, 11 cubic feet of broken stone.

The concrete block, when hardened, was placed in water for three or four days, then taken out and dried in air for three or four days. This process of first wetting and then drying was continued for two years, and then the plate was removed from the concrete and examined. The portion of the plate that was bright had remained unchanged. There was apparently no increase of rust in the small pits, but in some of them the color had changed from the originally reddish brown to a yellow. Professor Norton of the Massachusetts Institute of Technology, judges this to be merely a change in the composition of the old rust, and not a formation of new rust. Two other pieces of steel treated in the same way gave the same results.

CONCRETE ROADWAYS AT RICHMOND, INDIANA.

The advantage of concrete in many kinds of construction work is well known and universally acknowledged. But its use as a paving material for streets and roads is not so well established.

At Richmond, Indiana, this material has been used for paving several important streets, and is considered very satisfactory.

Some of its advantages are cheapness in first cost, compared to asphalt, brick, etc., smooth and noiseless surface, but affording good foothold to horses, lasting qualities and economy of maintenance, non-absorption of liquids rendering it thoroughly sanitary, and the fact that water is a benefit to it instead of a foe as in the case of most materials. Quality of material and workmanship is the most important factor in securing these desirable results.

Following are the specifications which govern the work at Richmond, all of which were prepared by Mr. H. L. Weber, city engineer, and submitted to your readers in the hope that they may be interesting and valuable.

Specifications for Cement Walks, Curb and Gutter, and Roadways.

SECTION 1. The contractor shall furnish all the labor, tools and materials necessary for the completion of the cement work and accessories as herein specified; also furnish all labor and materials required for protecting and repairing adjacent structures, maintaining public travel on the street or intercepted roads, walks and streets; all labor and materials required for any of the operations, principal or collateral, mentioned or implied herein.

All materials and labor shall be subject to the inspection and acceptance of the engineer and superintendent in charge.

Sub-Grade.

SEC. 2. Excavate to the full width and depth below the top of the grade stakes, as shown by plans. The material excavated shall be delivered by the contractor to such lots or tracts of land abutting upon the improvement that may require filling. After such lots are filled, the remaining material shall be delivered to such points as the Board of Public Improvements or engineer may designate, provided the haul does not exceed one thousand yards, otherwise said material shall belong to the contractor, to be disposed of.

Sub-Drains.

SEC. 3. Sub-drains shall be laid of 3 or 4-inch common drain tile, 8 inches below the sub-grade as shown by the plans. The tile shall be laid to a true grade and line, with close fitting joints, with clean gravel packed around and over them to the top of the trench. The tile shall be connected to such outlets as the engineer may determine. All junctions to be made with "Y" and "T" branches, and all deflections with curves of vitrified sewer pipe.

Trees, Roots, Etc.

SEC. 4. Trees shall not be injured, but roots of trees, which in any way interfere with the construction of the walk and its maintenance in proper manner, shall be cut away as the engineer may direct. The pavement shall be properly fitted around all fixtures in the walk.

Relaying, Etc.

SEC. 5. Where the material in any walks that now exist on the street shall be acceptable to the Board of Public Improvements, they shall be relaid to the grade and line established; the price therefor shall be determined by adding 10 per cent to the actual cost of the work as determined by the engineer.

Foundation "A."

SEC. 6. Upon the sub-grade shall be placed clean, coarse gravel eight (8) inches in thickness after being thoroughly wet and rammed, and to a uniform depth of 4 to 6 inches below the finished grade.

Foundation "B."

SEC. 7. Upon the sub-grade, prepared as shown by the cross section and as above specified, there will be placed a 6-inch layer of rubble, or field cobble stone, the refuse of quarries, old bowlders taken from the old bowlder curbing (if too large they shall be broken if used), or coarse gravel. Upon this layer shall be placed sufficient gravel to fill the interstices, and form a foundation with a total depth of 8 inches, after being leveled off and settled by flooding and ramming. Upon this bed will be placed a layer of good, clean gravel, 2 inches in depth, to be properly spread, packed, and smoothed, to receive the concrete curbing.

Concrete.

SEC. 8. Upon the foundation place the concrete 4 to 6 inches thick after being thoroughly rammed; it shall be uniformly one inch below the finished grade. The facing shall be placed in the templets forming the curb, backed up with concrete thoroughly rammed to place.

The concrete shall be composed of one part cement, two parts sand, and four parts gravel; the gravel can contain the sand, and three parts clean screened crushed lime stone. The proportioning of the cement, gravel and stone shall be done by placing a templet of the proper size upon a platform and placing therein the sand, gravel or stone by actual measurement in the proper quantities, leveling off the form with a straight edge; over the top evenly spread the cement in the proper proportions; remove the templet, turn the mass at least twice thoroughly, or until it is thoroughly mixed, add clean water from sprinkling can and thoroughly mix to make a concrete of such consistency that when deposited and rammed to place shall envelope every particle of sand with the cement, and every particle of gravel or stone with mortar. This result must be obtained to the entire satisfaction of the engineer.

The concrete shall be laid in blocks of the following dimensions: 6x7 inches for seven foot walk; 6x6 inches for six foot walk, and 6x5 inches for five foot walk, with expansion joint separated by two pieces of three-ply tarred paper, at each 33 feet of line, and intermediate joints with dry sand, as the engineer may direct.

Wearing Surface.

SEC. 9. Before the concrete has set, deposit the wearing surface, which shall be one inch in thickness, composed of one part cement and two parts clean, coarse, washed sand, if the nature of the material require it; or one part cement, one part sand, and one part clean, crushed stone screenings. First mixed thoroughly in a dry state, then add sufficient clean water, and thoroughly mixed into a medium soft mortar. Deposit this upon the concrete and trowel down to insure a perfect contact, then level with a straight edge from the grade strips. When sufficiently hard, float and trowel to a smooth continuous surface. Avoid dusting the surface with dry cement.

The surface, except a marginal draft two inches wide around each plate and five inches along curb line, shall be pitted with a brass roller acceptable to the engineer.

The wearing surface shall be cut in blocks the same size as the concrete base. As soon as the work has properly set, all templets to be removed and edges plastered to the full depth of templets, if required by the engineer.

All walks shall have a rise of one-fourth inch per foot from the curb to the lot line. Strips properly staked shall be set on both sides of the walk to keep it straight, being careful that the grade and fall are correct. Any walk not properly laid, must be taken up and relaid by the contractor.

Cement Curb, Gutter and Crosswalks.

SEC. 10. The cement curb, gutter and crosswalks shall be constructed in place, under the direction of the engineer, upon a bed of gravel 8 to 10 inches in depth, after being flooded with water and compactly rammed to an even surface. Upon the sub-grade will be laid Foundation A or B, and as shown by plan. The curb and gutter or crosswalks will be composed of concrete, formed by intimately mixing, dry, one (1) part Portland cement, two (2) parts coarse, clean sand, washed if necessary, three and one-half parts of clean, medium size gravel, and three parts of clean, screened lime stone, crushed to pass through a screen of one and one-half mesh, to which add sufficient clean water to form a concrete, that, when placed in the templets and thoroughly rammed, free mortar will appear on the surface. The ramming of the concrete in the forms shall be done with the proper tamping bars and other tools to insure a compact homogeneous mass, with full square corners. The stone shall be sprinkled before it is added to the mortar. The proportions being given intended to form a concrete in which every particle of sand shall be enveloped by cement, and every particle of gravel and stone enveloped by mortar, this result must be obtained to the satisfaction of the engineer. All exposed surfaces shall be covered with a finished coat one (1) inch in thickness, composed of one part cement, one part of fine, clean stone screenings, and one part of clean, coarse sand.

The facing shall be placed in the templets forming the curb backed up with concrete and thoroughly rammed to place. The top facing of curb and gutter shall be thoroughly troweled to insure perfect contact. When sufficiently hard, float and trowel to a smooth true surface. The curb to be constructed with the top edge to the established grade of the street; the upper and lower face corner to be rounded to a radius of one inch. The curb shall be six inches thick at the top, and the gutter eight inches thick, and twenty-eight inches wide, and constructed in seven foot sections, alternately. When the intervening sections are constructed there shall be a strip of tarred paper placed in the joints, as the engineer may direct.

The proportioning of the cement, sand, stone and gravel shall be done by placing a templet of proper size upon a platform, and placing therein the cement, sand, stone and gravel in the proper quantities by actual measurement, leveling off the templets with a straight edge. Wrought iron protections will be built in all corners and places designated.

Roadway Pavement.

SEC. 11. The sub-grade will be thoroughly rolled, leveled and re-rolled until it is true to grade and cross-section of the finished roadway, and from 8 to 12 inches below the surface of the street, as the case may be.

If found necessary for sub-drainage, upon the sub-grade, place three or four inches of gravel, thoroughly wet and consolidated by rolling or ramming, or both.

Upon this gravel foundation will be placed a layer of concrete four to five inches in thickness and finished to a true crown and grade, parallel to the finished street surface and three to four inches below the same. This will constitute the foundation for the cement roadway.

When sufficiently strong to sustain the roadway paving, the surface of the concrete foundation will be covered with a coating of fine sand, raked off with a flat board rake, by hand, so as to remove all sand except that which may remain in low places and voids in the concrete foundation.

Upon this will be placed a layer of thin tar paper (or other suitable paper) or material to act as a separating joint.

Upon this will be laid the concrete pavement 2 to 3 inches thick, in sections the full width of the street and ...... feet in length, with expansion joint next the gutters and ends.

This roadway concrete will be composed of one part cement, 2 parts sand, 3 parts gravel and 3 parts crushed stone, mixed with water to form a rather wet mixture.

Upon this will be placed the wearing surface, one inch thick, composed of one part cement, one part clean, sharp sand, and one part clean stone or granite screenings, mixed with water to form a rather wet facing mixture.

The wearing surface will be deposited in two layers, one-half inch thick, the first to be thoroughly rammed to insure perfect contact; the second applied immediately after, and thoroughly troweled and worked over, and made to conform to the finished surface of the street by the use of the proper forms.

When sufficiently hard, the surface to be floated and steel troweled, and, lastly, raised with a cork float, and when finished must be true to grade and cross-section.

All concrete must be machine made or thoroughly mixed by hand, as the engineer may direct.

Cement.

SEC. 12. The cement shall be the best American Portland or any other equally as good or better. No mixing of different cements will be allowed.

All cements must meet the following requirements:

Fineness—Not less than 95 per cent to pass a 50 mesh sieve, and not less than 85 per cent to pass a 100 mesh sieve.

Time of setting—Initial set in not less than one hour.

Tensile of strength—One day, neat, 125 pounds. Seven days, neat, 400 pounds.

Constantcy of volume — Cement shall not contain more than 3 per cent of magnesia, and must remain perfectly flat and free from cracks after remaining in water for 28 days, and shall stand, without cracking, a temperature of 212 degrees Fahrenheit, after immersing in water for 24 hours.

All cement shall be kept in suitable houses for the purpose.

Sand.

Sec. 13. The sand shall be clean, coarse river or bank sand, acceptable to the engineer.

Water.

Sec. 14. None but clean, clear water shall be used, which must be furnished by the contractor.

As soon as a section is finished, it shall be protected by placing muslin or canvas thereon, and in dry weather it must be kept moist for 5 days by thoroughly sprinkling.

Street Crossings.

Sec. 15. Where drive ways, alley crossings or street crossings occur in the line of walk, the walks will be made of special construction as shown by plans, or as directed by the engineer. Letters shall be placed as directed by the engineer.

Work Suspended.

Sec. 16. Any work not finished in the time specified shall be discontinued for the season, upon notice from the board of public improvements, and not again commenced until said board shall order the contractor to begin work. No work shall be laid in freezing weather.

Steps.

Sec. 17. At points where it will be necessary to construct platforms, steps or other appurtenances, along any building in order to harmonize said building to the established grade, the outside line of said appurtenance shall be ...... feet from the curb line and parallel therewith.

The specifications are general and are filled in to suit the case under consideration.

CEMENT IN CENTRAL STATION DESIGN.

(A paper presented at a meeting of the Chicago Branch of the American Institute of Electrical Engineers by Eugene B. Clark.)

The Illinois Steel Co. has just completed and placed in operation at its plant in South Chicago a new power house for the supply of power to its various mills at South Chicago, and at Buffington, 10 miles distant. This station contains, at the present time, two units, each consisting of a 2,000-kw., 25-cycle 2,200-volt, three-phase generator, direct driven by a 24x60x48 in. horizontal-vertical, cross-compound engine. The addition of two more generating units, of a capacity of 4,000-kw. each, is contemplated in the near future. This alternating-current station operates in conjunction with a direct-current station which has been in operation for some time. The two power houses are connected by means of synchronous converters. Both stations take steam from blast-furnace boiler houses, in which the fuel is excess blast-furnace gas. The supply of this excess gas is quite variable at times, and it is desirable under such conditions to be able to shift load from one station to the other, as desired. Such an arrangement gives the opportunity of utilizing completely all excess blast-furnace gas at either point.

The foundations for the machinery and the building rest upon piles and are made of slag concrete, consisting of one part cement, three parts torpedo sand and seven parts crushed slag. The cement used for those parts of the foundations which are not exposed was of the brand known as "Puzzolan"; for those parts which are exposed, "Universal" Portland cement was used. The foundations were started in the coldest weather of last winter, and the concrete, which had to be mixed with warm water and warm sand to keep from freezing in the mixer, did freeze immediately after being tamped into place. Filling was used to follow up the foundations as rapidly as they were put in place, so that the concrete was not permitted alternately to freeze and thaw as the warmer weather came on. The result was to obtain a thoroughly solid foundation, the concrete setting up firmly as it gradually thawed during the spring months. About the middle of summer the foundation was tested by drilling a hole several feet deep into that part which had originally been frozen. It was found that it had set up to make an extremely solid and strong concrete.

A considerable amount of time and attention were devoted to determining the most desirable method of floor construction. The power house apparatus is controlled by electrically operated switching devices. The electrically operated switches, together with the bus-bars, control-pedestals, instrument-posts and feeder-panels, required for their accommodation the construction of galleries at one end of the engine room. Two of these galleries were built, and the engine room floor was used as another gallery. On the engine room floor were located the generator switches; on the first gallery were located the bus-bars, the instrument-posts, generator-control pedestals, feeder-panels, etc.; on the third gallery were located the feeder-switches and the lightning-arresters. A transmission line, carrying a pressure of 20,000 volts, was necessary to transmit the required amount of power to Buffington, located 10 miles south of South Chicago. At least 4,500 kw. of transformers had to be located in the power house. It was decided best to place these on the engine room floor, under the first gallery, constructing an isolated transformer room for that purpose. The transformer room was isolated from the rest of the apparatus on the engine room floor by means of a wall about 3 inches thick and 17 feet high, built of reinforced concrete, in accordance with the method to be described later. This wall proved, after erection, to be thoroughly solid and substantial; as rigid, in fact, as would have been a masonry wall 12 inches or 14 inches thick. It then became necessary to take wires carrying a pressure of 20,000 volts through the operator's position on the first gallery. In order to harmonize these various requirements it soon became evident that much additional space would be required if it should prove necessary to have the usual steel beams in the gallery floors, inasmuch as the beams would be in the way of the many wires which it would be necessary to take through these floors. These conditions pointed to the advisability of using a floor construction of concrete slabs or of fireproof tile. Careful consideration of the subject proved that, even with the comparatively long spans for such heavy loads, the concrete construction would be far preferable, both from the standpoint of cost and from the standpoint of fireproofing.

To make certain of the safety and conservatism of the proposed design, a section of the floor, as proposed, was built and tested prior to the final decision as to the construction of the floor for the building and galleries. After being allowed to set 21 days, this section of floor was tested by piling pig iron upon it, to the extent of 500 pounds per square foot. The test slab was 7 inches thick and 15 feet span, made of concrete, consisting of one part Universal cement, two parts torpedo sand and four parts 0.5 to 1 inch crushed limestone, reinforced with 0.5 inch steel rods, spaced 5 inches apart and laid on top of No. 10 gauge expanded metal placed 1 inch from the bottom of the slab. Upon test, the slab collapsed under a load of 550 pounds per square foot. An even distribution of the load over the surface was obtained by covering the top of the slab with about 4 inches of sand, upon which was piled the pig iron. Deflections were measured as the load increased. The deflection at the center had risen to about 1.5 inch by the time the slab failed. It was determined that the expanded metal was comparatively valueless for purposes of reinforcement when used in conjunction with the 0.5 inch round rods, as all the tension was taken by the rods. These rods were bent at the ends for a distance of about 10 or

12 inches through an angle of 180 deg., thereby insuring that they would not pull out at these points. It was found necessary to bend the rod through 180 deg., and not through 90 deg.; for those which were bent only 90 deg. showed a very decided tendency to crack the concrete at the corners and then to pull out. Round rods were used in preference to twisted or notched, or any other form of rods designed to prevent slipping or pulling out of the concrete, and for two reasons: First, the round rods are far cheaper; secondly, it was decided that nothing was gained by preventing the rods from pulling out of the concrete, provided they were properly fastened at each end. The mixture used in all the floor construction was one part Universal Portland cement, two parts torpedo sand and four parts crushed limestone, 0.5 to 1 inch mesh. The shoring under all floors was permitted to remain 28 days before removal. In the engine room floor, for the very long spans, some floor beams were used, but in all cases they were entirely covered with concrete, to give thorough fireproofing.

Wherever generator-pits or flywheel pits were to be covered, such covers were made of cement castings, reinforced with expanded metal, rather than of cast iron. These cover plates were made to exact fit for each place as the work progressed, no drawings being necessary. The carpenter made a small mould of the correct size, in which the cement worker cast his floor plate and finished it exactly as the rest of the floor. The gallery floors were completed and the shoring removed before any work was done on the installation of the electrical control apparatus or the supports therefor. Each gallery was treated as independent of the one under it, so far as support was concerned, though, in building up the switch-cells, the busbar construction and the barriers, the practical result was to give additional support to each floor from the one under it. The switch structure was also constructed in such a way as practically to be a beam in itself. Round iron rods were cast into the lower part of the structure and allowed to extend through from the first switch in the row to the last. The result was to provide a construction of the switch-cells, which, being in itself a beam, would distribute the load to those points where it might best be taken. In addition to this fact, the barrier which rose from the switch-cell to the ceiling above, taken in conjunction with the lateral barriers—all of which were built monolithically with the wall rising from the switch structure—formed a column of great strength. It would probably not be poor engineering to depend, in a measure, upon the strength of this column to support the floor above it; but in the case which is being described this was not done. Even though no attempt was made to utilize the switch structure as a column, still, the fact was taken into consideration that there would be a natural tendency, by reason of the presence of the switch structure, to transmit load from one floor to the one under it, and therefore to impose a greater load upon the lower floor than would be accounted for by the weight actually upon that floor. This effect was compensated for by giving the lowest floor additional supporting columns, which were placed between the basement and the engine room floor. These columns were covered with expanded metal and a cement plaster to insure against failure, in case a fire should occur, due to the storing of inflammable materials. It had not been contemplated that such materials should be stored in the basement, but it was thought wise to provide against this contingency.

The roof of the engine house was constructed of concrete laid in place as is usual for sidewalks. In each bay a removable wooden frame was secured to the structural roof chords in such a way as to permit of ready removal by knocking out wedges after the roof was in place. A thin layer of cement mortar, consisting of cement and sand, was placed on the top of this woodwork support. The function of this thin layer was to give a smooth coat for the finished interior of the roof. The expanded metal reinforcement was laid immediately on top of this preliminary coat, and was covered with about 2 inches of concrete of about the same mixture as was used for the floors. On top of this was placed a thin layer of rich mixture, which was given a sidewalk finish on the side exposed to the weather. After 28 days, the wooden supports were removed from the inside by knocking out wedges, and were lowered to the engine room floor. The room made in this way developed cracks after drying out. These cracks were filled by pouring into them a thin grout consisting of cement and sand. The result was to stop all leaks and insure a roof which was cheap and thoroughly fireproof. It has the disadvantage of being heavy and requires rather heavier roof-trusses than does a tile or slate roof; it is very strong and is not damaged by men walking upon it, or by falling pieces of stone or other materials. The latter consideration is an important one in the case described, because the station is located near blast furnaces, which, unfortunately, have the habit of throwing stone and ore out of the top at times.

The electrically operated oil-switches which are usually mounted in a brickwork cell structure, were mounted in a cell structure built up of concrete. A collapsible wooden mould was made, set up in the proper position for the switch, and filled with concrete from the top. This mould was built similarly to a hinged flask standing on end, and was made large enough to allow of casting two switches at one setting. The mould was properly lined up, leveled and braced to prevent moving while tamping the concrete. The bolts for holding the switches in place were set in the concrete of the cell structure by means of a template on top of the mould, just as foundation posts for engines are set. The concrete mixture was one part Universal cement, two parts torpedo sand and three parts screened limestone, which would go through a ⅜ inch mesh. After the mould was constructed, the only skilled labor required was that of the carpenter, who lined up the mould each time it was moved into a new position. After the concrete had set approximately 48 hours, the mould was stripped and again set up for the next two switches. After all the switches of a row had been cast, and the moulds removed, the cement worker went over them to point up any voids which might have occurred in the corners, and to give the whole structure a finished appearance. The result was a pleasing one. It was decided that the mould—which in this case was built of dressed lumber, in the attempt to give a smooth and finished appearance to the concrete work—might better have been of rough lumber, in which case it could have been built for about $50. In case a large number of switches were to be built, however, the speaker would recommend the construction of a metal mould, which perhaps would cost $100. A mould constructed of metal would be free from liability to warp, which always exists in the case of a wooden mould.

The wires leading from the oil-switches were separated from each other by means of barriers built up of thin slabs of concrete. The method of construction of these barriers was simple and effective. Pipes, or 0.5 inch rods, were set up and tied together with wire in the form of the proposed compartment construction. A light metal lath, such as is used for plaster partitions in building construction, was then wired to the light framework. A cement mortar was then applied, in the same way as the plaster. The cement worker became so expert in doing this class of work that he could build these compartments more rapidly than a draughtsman could make the drawings for them.

The bus-bar structure was built up

in the same way as was the cell structure for the oil switches. Where lines left the building, or where they were run in any horizontal position, barriers were suspended from the ceiling by allowing a piece of metal lath to project down at the time the floors were put in. The barrier was plastered to this piece of lath in the same way as just described. Where conductor wires were taken through the floor, which, of course, was frequently necessary, the insulators were set into the concrete as the floor construction progressed; therefore, when the floor and switch construction was completed the wiremen had the insulators through which the wires were to be run properly located. One great advantage of this form of construction rests in the economy of space which it makes possible. Any brick wall must necessarily be 4 inches thick, whereas a concrete wall may be put up only 2 inches thick, provided it is reinforced. In case brick construction is employed, where thin partitions are desired, they must be built of soapstone or marble. The concrete is just as effective in most cases, and is much cheaper.

In constructing the switchcells and bus-bar structures, an attempt was made to obtain a perfectly smooth finish by dressing the mould smooth and coating it with shellac, as is customary for patterns. This was found to be a mistake, as the bubbles of excess water contained in the web mixture tended to gather on the smooth surface and make a rough finish to the work. It was found preferable to leave the mould rough and to finish the work with a final float-coat.

The generator leads were brought from the machines in 3 inch bituminized fibre conduits, laid in the cement floor of the basement. Under the generator switches, they were brought from the basement floor to the engine room in a solid concrete wall. The lead sheathing was removed from the cables, and additional coating consisting of paper and shellac was provided. After allowing a few days for this to dry, the cables were built into a wall of concrete. Inasmuch as the wall was only a few inches thick, little difficulty would be encountered in cutting the cables out, if necessary; in fact, three cables were cut out, under the mistaken impression that they were improperly connected. Little difficulty and slight expense were involved in the operation, and the cables were found to be in perfect condition. In the basement, no important wire or cable was permitted to be exposed. The result is that if a fire should start in any material which might be stored there it could not affect the connections to the generators or instruments, nor could it cause the collapse of the structure, due to the failure of exposed steel columns.

The instrument leads and the control wires for the switches are buried in cement. It was originally intended to use for this purpose lead-covered cable run in an iron-armored conduit, the latter being imbedded in the floors. It was decided later, however, to do without the iron-armored conduit, and to lay the cables directly in the cement floor. For this purpose, a top coat of 2.5 inches of cement on the floor was allowed, in addition to the original cement floor which was designed to support the full loads. Of this top dressing, 2 inches consisted of a mixture of cement, sand and sawdust, in the proportions of one of cement, one of sand and two of sawdust. The method of installation consisted of laying the conductor cables on the top of the original supporting floor. When all the instrument wiring was completed and tested, the cables were covered and imbedded in this mixture of sawdust-cement, and on top of all was laid a 0.5 inch finishing coat for the floor. The mixture of sawdust-cement is soft enough to permit of chopping a cable out at any time without damage to the cable, or to surrounding cables. The repair of the floor is very simple, and the floor is perfectly solid and to all intents and purposes the same as if constructed wholly of concrete. The necessity for chopping out cables is very remote, because, once properly installed, there is no chance for movement or damaging of the cables. The item of labor saved by making it unnecessary to draw into the conduit the very great number of cables which are required for the installation of electrically controlled switching apparatus is very considerable.

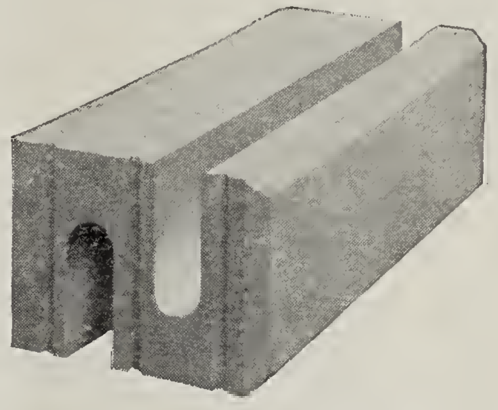
The 20,000 volt wires which were led from the transformer room on the first floor to the lightning arresters and building outlets on the top gallery were provided with thorough protection where they passed through the operator's gallery. For each wire a chimney was built of 10 inch bituminized fibre conduit. The three chimneys carrying the three wires of a circuit were placed close together and were surrounded with a construction of expanded metal lath, covered with cement plaster. The result was to outward appearance a rectangular column. In effect, there was a thoroughly insulated duct provided for the conveyance of each high-pressure wire, which acted to prevent entirely the possibility of an operator coming into contact with these wires in any way.

After the installation of all apparatus and connections thereto, the cement work was given a final finishing wash of whiting, glue and a slight amount of dark coloring matter, producing a uniform cement color over the whole job. It is impossible to produce this without some such wash, since all cement work will discolor more or less as it dries out.

The final result is most pleasing from both engineering and artistic standpoints. Not much effort was taken at the start to lay out the work with a view to insuring good architectural lines, but even though this was not looked to as it might have been, it was possible, by adding a touch here and there, to get some very satisfactory effects from the standpoint of appearance. Of recent years, most large power-houses are designed with a view to obtaining good architectural lines on the exterior, whereas the interior is generally designed from an engineering standpoint only. The possibilities of cement construction in insuring artistic and decorative interior effects, with very slight increased cost, and without sacrificing engineering requirements, have so far received too little consideration.

THE BLAKELEE CONCRETE BLOCK MACHINE.

This machine forms blocks with double insulating air spaces designed to prevent moisture, heat and cold from penetrating through the wall.



The air spaces shown in the block overlap each other and are continuous with the horizontal stretch of the wall. The machines for producing these blocks are manufactured by The Blakeslee Concrete Block & Machine Co. of Columbus, Ohio.

The Boyd Transfer & Storage Co. of Minneapolis, Minn, will erect a fireproof storage warehouse on Lake street and 4th avenue S. of reinforced concrete to cost from $70,000 to $75,000. Lowell A. Lamoreaux, architect.

Bartlett & Kling, contractors, Cedar Rapids, Iowa, have secured the contract for the inside finish for the Third Avenue Hotel, 65,000 feet of cement floors, 7,500 feet cone base marble finish, 1,000 feet concrete sidewalk light work, 30,000 yards plastering, 20,000 feet Terrazzo floors with Terrazzo cone base, and considerable other work in the same hotel.

THE INTERNATIONAL PORTLAND CEMENT WORKS AT HULL P. O., CANADA.

By John McClelland Bulkley

The employment of Portland cement to largely displace stone for building purposes has made rapid strides during the past three years, and in view of the inevitable increased demand for this material in Canada, a limited number of plants have been erected in the province of Ontario. In the province of Quebec there has been under construction, and now nearly completed, works which rival in size and excellence of construction any known works of the kind on this continent.

It was projected by the International Portland Cement Co., Limited, composed of many prominent and wealthy citizens of Canada and the United States, with offices at Ottawa and Toronto. The business sagacity of these gentlemen was shown in the selection of the site, and in the erection of a thoroughly up-to-date plant.

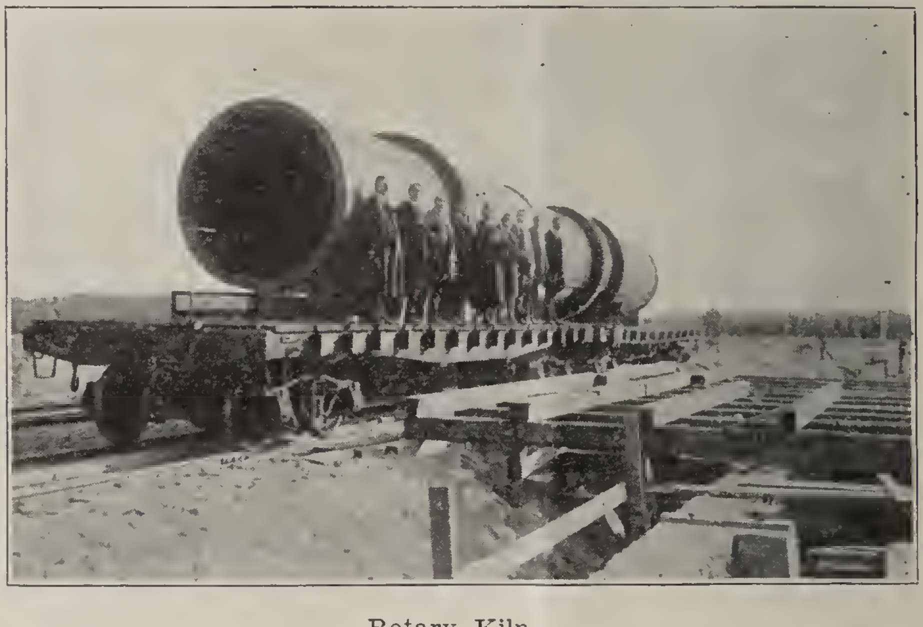
International Portland Cement Works.

A description of the enterprise, with the accompanying illustrations, will be of interest to the readers of the Cement and Engineering News.

The works of The International Portland Cement Company, Limited, which are now nearing completion, are located within the city of Hull, Quebec, and less than two miles distant from the Dominion Parliament Buildings in Ottawa. The location has many natural advantages and is remarkably well suited for the manufacture and shipment of cement. The two raw materials, rock and clay, lie side by side upon the company's property and the mill is located where they meet so that the clay is brought into one side and the rock into the other. The rock property consists of 220 acres of a high grade of lime stone and the clay property of about 110 acres of clay land. Both materials have been core bored and thoroughly tested, proving to be of excellent quality for the production of a high grade of Portland cement. Two lines of railway, the Canadian Pacific and the Ottawa Northern and Western, cross within one hundred yards of the mill. The plant has also the advantage of direct shipment by water, since it is located on the shore of Leamy Lake from which a government canal leads to the Gatineau River, almost at its confluence with the Ottawa. From the Ottawa barges reach Montreal and Quebec by means of the Ottawa and St. Lawrence Rivers, while the Rideau Canal affords direct communication with Kingston and other lake ports. The freight rates on cement from the Western Ontario mills are so high that the eastern portion of Canada has had to depend almost entirely on the European and American cements. The International Company, being the farthest east of any of the larger mills and having such excellent transportation facilities, should find a ready and extensive market for its output.

Another advantage which this company enjoys is the proximity to abundant water power. The power for the operation of the plant is obtained from the Chaudiere Falls of the Ottawa River and is transmitted to the factory as three-phase alternating current at 10,000 volts where step-down transformers reduce the pressure to 600 volts for the operation of induction motors.

The factory itself, which will have a capacity of about 2,000 bbls. per day, is of thoroughly modern design and construction throughout and no effort has been spared to make it the best equipped, as it is the largest, cement mill in Canada. The plant which comprises twenty buildings occupies a plot of about eleven acres, the ground actually covered by the building being over three acres in extent.



Rotary Kiln.

The kiln building, the clinker storage, the clinker buildings, the cement warehouse and the coal drying and grinding buildings are of steel, while the buildings for the preparation of the rock and clay are of wood. The walls of most of the buildings are of hollow cement blocks to a height of about eight feet, above which they are of cement plaster on expanded metal. The machine shop, blacksmith shop, store room, transformer house and the chemical laboratory are built entirely of hollow cement blocks; the clay storage, rock storage, air compressor house, and clinker storage have heavy walls of stone; and the pumping station, situated on low ground near the lake, has walls of monolithic concrete.

The rock quarry will be opened at the south end of the plant whence the rock is brought to the crushing department by a 1,600-foot cableway with towers 125 feet high, the tail tower being movable upon tracks so that the cable can be swung around to follow up the receding face of the quarry. The rock is dumped from the cableway skips into the hopper of a No. 7½ Gates gyratory crusher and passed through a revolving screen from which tailings more than 1½ inches in size go to a No. 4 Gates crusher and are reduced to a requisite size. It then drops into the buckets of a McCaslin conveyor, which is so arranged that the rock can be carried direct to the dryers or can be dumped into the storage building for use at night or on days when work in the quarry is impracticable. The lower run of this conveyor passes through a tunnel under the storage building and the rock can be drawn through the gates in the top of this tunnel directly into the conveyor which carries it to the dryers. By this arrangement one conveyor serves to carry the rock from the crushers to the storage, and also to carry it from the storage to the dryers when this is required. The rock dryers, which are 60 feet in length, are of the revolving cylinder type, and the drying is done by hot air drawn through them by means of exhaust fans placed at the upper end. From the dryers the rock is elevated and carried by a belt conveyor to the feeding hoppers of the ball mills, where it is ground to pass a twenty mesh screen.

The clay pit will be opened up at the north end of the plant and the clay brought in by a cableway of 1,250 feet span, with towers 80 feet high. From the cableway buckets it is dumped into a disintegrator, from which it falls upon a belt conveyor, which carries up an incline and discharges it into the top of dryers similar to those for rock. The clay from the dryers is then ground and conveyed to the storage house, which is 68 feet wide by 200 feet long, and has a capacity sufficient to carry the plant over five months' run, thus obviating the necessity of bringing in clay during the winter months when it is difficult to handle and to dry. From the storage building the clay is carried by elevators and conveyors to the mixing department, where it is mixed in proper proportions with the ground rock from the ball mills and deposited in the feeding hoppers of the tube mills. From the tube mills the finely ground mixture is conveyed to a large steel bin in the top of the kiln building, from which it is fed by adjustable feeders into the rotary kilns.

Ball Mills.

The kilns, which are 7 feet in diameter and 60 feet long, are of especially heavy construction; and the supporting and driving arrangements have been designed to obviate, in so far as possible, any chance of breakdown or stoppage. A line shaft driven by a motor at either end drives the kilns by reduction gears mounted on heavy base plates. This shaft is so arranged that all kilns can be driven by either motor, or part of them driven by one motor and part by the other. Friction clutches on each drive provide for the starting and stopping of any kiln independently of the others; and change gears, thrown in or out by friction clutches, give the required variations in the speed of rotation of the kilns.

The clinker from the kilns falls into covered pits, whence it runs by gravity into the buckets of a McCaslin conveyor and is carried to the clinker storage building. This building, which has heavy stone walls strongly buttressed to withstand the pressure of the clinker when full, is 67 feet wide by 100 feet long and has a storage, is a tunnel through which passes another conveyor running to the grinding department. The clinker can be drawn from the storage, through chutes in the top of the tunnels, into this conveyor, from which it is discharged into steel hoppers over the ball mills. After passing through the ball mills it is conveyed to the tube mills to the top of the warehouse, where it is discharged into the bins.

Machine Shop, Cement Block Construction.

The warehouse, which is eighty feet wide by two hundred and ten feet long, has a storage capacity of about one hundred thousand barrels of cement. The roof trusses and supporting columns are of steel while the bins are of plank laid up in crib fashion, as in grain elevators, and strongly tied together by iron rods. Beneath the center of each row of bins is a tunnel through which runs a conveyor leading to the packing room. The cement in any bin can be drawn through gates in the top of the tunnels, into these conveyors and carried to the packing room, where it is elevated and deposited in overhead bins ready for packing. Two side tracks run upon each side of the packing room and the cement can be trucked directly to the cars ready for shipment.

The coal storage, drying and grinding buildings are separate from and at some little distance from the remainder of the plant. The coal, if brought in by rail, will be dumped directly into a large toothed-rool crusher under the track; if brought in by canal boats it will be carried by a system of conveyors to the same point and discharged into the crusher. From this crusher it drops into a bucket conveyor, which deposits it in the storage building. This building is forty-eight feet wide and two hundred feet long and has a storage capacity of ten thousand tons. The construction is of elevator crib work similar to the cement warehouse. From the storage the coal is carried to the dryers, which are simliar in construction to those for rock, by a bucket conveyor running through a tunnel under the storage building. A noticeable feature here is the utilization of waste heat from the clinker for drying the coal. An air duct in front of the kilns and connected with the clinker pits leads to the coal dryers. Exhaust fans placed at the upper ends of the dryers draw the hot air from the clinker pits through the dryers, thus affording a safe and economical method of drying the coal. After leaving the dryers the coal is passed through two sets of crushing rolls and is finally reduced to powder by means of tube mills. The powdered coal is carried by a system of elevators and conveyors to steel tanks in front of the kilns from which it is fed to air blast injectors and blown into the kilns. The amount of coal dust supplied and the blast of air can both be regulated according to the requirements of the kilns. The air for the injectors is supplied from either of two blowers, each of which has an independent motor drive.

The rock drills in the quarry will be operated by compressed air furnished by an Ingersoll-Sergeant cross compound compressor, belted to 150 H. P. induction motor.

Although the plant is situated within the city of Hull, a complete fire protection system has been installed. Two seven hundred gallon Worthington turbine pumps direct connected to induction deliver water to an eight-inch main, which supplies a loop line encircling the principal parts of the plant, and having upon it ten hydrants. A branch from the main line supplies water to a fifty thousand gallon tank on a 77 foot tower. For ordinary service only one pump will be used. This pump will fill the tank and supply the regular demand. In case of fire the line leading to the tank will be closed and both pumps operated in series to give high pressure on the mains. The power for operating the pump motors is brought in by an independent line which is kept at a safe distance from all buildings so that the service of the pumping plant would not be interfered with by any accident or conflagration in the factory.

The power throughout the plant is supplied by induction motors, of which there are fifty-seven, ranging in size from five to one hundred and fifty H. P. The large number of motors is due to the fact that all machines requiring large power, and some smaller machines, when at a considerable distance from others are provided with separate motor drives. Only groups of machines which must always be operated together (as a system of elevators and conveyors) are driven from one motor. This arrangement greatly simplifies the distribution of the power and makes possible a much more convenient and economical arrangement of the machinery than would be practicable if the driving were done from a few main lines of heavy shafting. Perhaps the most notable feature of this mill, to one familiar with older type of cement factories, is this convenience of arrangement with reference to the passage of the materials through the different processes. The elevating and conveying machinery is thus made comparatively simple and the materials travel continuously and directly from the raw material departments through the different processes to the cement warehouse.

The structural steel for building was furnished and erected by The Brown-Ketcham Iron Works of Indianapolis, Indiana, and the cableways by The Flory Manufacturing Co. of Bangor, Pa. Aside from these contracts almost the entire work has been done by the Cement Co. under the direct supervision of its own engineers, named below, who also prepared all plans and specifications for the plant. The electrical equipment was furnished almost entirely by the Canadian General Electric Co. of Toronto. The elevating and conveying machinery was purchased from John A. Mead & Co., the Link-Belt Engineering Co., the Jeffrey Mfg. Co. and the Stephens-Adamson Mfg. Co. The tube mills and drop crushers were manufactured by the Allis-Chalmers Co. and the Ball Mills by Frederich Krupp. The kilns and the supporting and driving arrangements for them were furnished by the Bonnot Co. and by the Hill Clutch Co.

A spacious, well-lighted and ventilated machine shop is not the least of the admirable group of buildings. This is adequately equipped with machinery and machine tools of the latest designs and best manufacture, which, together with the scales, cement testers, etc., were supplied by the Fairbanks Co., through their Montreal Branch.

The engineers who prepared the plans and have been throughout in charge of the work, are Mr. R. D. Hassan and Mr. A. C. Tagge. Mr. P. W. Stanhope is secretary of the company and Mr. J. S. Irvin is the managing director.

The officers of the company are: Sir Sanford Fleming, K. C. M. G., president; Hon. A. F. McLaren, vice-president; P. W. Stanhope, secretary; J. S. Irvin, managing director.

NEW CEMENT BUILDING BLOCK FACTORIES.

Alabama.

B. J. Schuster, Selma.

Colorado.

Dodds Bros., Loveland.

Georgia.

Dykema System Concrete Co., Atlanta.

Illinois.

Orrie T. Dunlap, Edwardsville.
Robinson & Stuart, Kewanee.
Downey & Son, Decatur.
Carlyle Concrete & Construction Co., Carlyle.
C. W. McFarland, Kewanee.
W. D. Pratez, Sterling.
F. B. Thomas, Tampico.
J. D. McCarthy, Ashland.
W. F. Doering, Greenville.
Grant Hungerford, Mt. Carroll.
Concrete Construction Co., Rock Island.
G. W. O'Neil, Farmer City.
Ellis Kiser, Chillicothe.
J. M. Full & Sons, Metamora.

Indiana.

Morristown Concrete Co., Morristown.
Haines & Good, Marion.
Lewis McNutt, Brazil.
Lafayette Gravel & Concrete Co., Lafayette.
Gray, Stewart & Denney, Portland.
Kendallville Mfg. Co., Kendallville.
Wm. Coon & Son, Frankfort.
Fulton Bros., Hartford City.
J. H. Luttereil and W. C. Cantrell, Lake Station.

Iowa.

Ole Olson, Rock Rapids.
Jacob S. Johnson, West Union.
Green Bay Lumber Co., Clarinda.
Minnick Bros., Washington.
S. G. Funk, Panora.
T. R. Riggs, Centerville.
J. W. Schwartz, Shenandoah.

Kansas.

Geo. Turbush, Nickerson.
Kingman Cement Block Co., Kingman.
A. Heffner, Sterling.
Lawrence Granitoid Mfg. Co., Lawrence.
T. P. Wheatley, Salina.
T. E. Wright, Hutchinson.

Kentucky.

Simon Green and F. P. Jenkins, Paducah.

Maryland.

H. P. Holstein, Fernandina.

Michigan.

O. S. Bolton, Ludington.
Vanauken & Law, Rives Junction.
E. H. and W. F. Molineke, Allegan.
Thos. Painter and H. M. Lindsley, Chesaning.
J. A. Evitts, Mesick.
A. Burland, Whitehall.

Minnesota.

Peter F. Schoeffer, Jordan.
Clarion Concrete Co., McCloud.
H. C. Roloff, Welcome.
Edward Adolphson, Morris.

Mississippi.

McCormick & Thompson, Brookhaven.

Missouri.

Cook Bros., Linneus.
Lee Kerr, Callas.

Nebraska.

Geo. Roberts, Ravenna.

New York.

Howk & Williams, Caledonia.

New Jersey.

Bloomer Bros. Co., Newark.

Ohio.

Masterson & Wason, Ashtabula.
Hauk & Dicus, Findlay.
Joseph Campbell, Jr., East Liverpool.
Jacob Horr, Urbana.
Aetna Cement Block Co., Toledo.
Stoker Bros., McComb.

Oklahoma Territory.

Joseph Sampson, Guthrie.

J. T. Gumaer, Kendrick.

Oregon.

M. D. Scott, Portland.

Pennsylvania.

Faber & Sons, Carlisle.

Texas.

Frank Mazzel, Denison.

West Virginia.

Bridgeport Concrete Co., Bridgeport.

W. A. Kidder and G. W. Searles, Moundsville.

Wisconsin.

Chas. Kuster and Wm. Paasch, Plymouth.

Schnette Cement Construction Co., Manitowoc.

NOTES ON LUTES AND CEMENTS TO ENGINEERS.[*]

By Samuel S. Sadtler.[†]

In a recent paper read by me before the Chemical Section of the Franklin Institute I treated in a general way of the subject of lutes and give some examples under the following heads: (1) Plaster of Paris; (2) hydraulic cement; (3) clay; (4) lime; (5) asphalt and pitch; (6) resin; (7) rubber; (8) linseed oil; (9) casein and albumen; (10) silicate of soda and chloride cements; (11) flour and starch; (12) miscellaneous. When asked to read a paper before this club, I thought it might be of interest to treat of certain kinds of lutes and cements most likely to be used by engineers and arranged according to the intended application.

I have taken up this subject, not because there was little to be found in literature, but because what is recorded is not very dependable and is, in most cases, vouched for by no one. It seems to be copied and abstracted from one source to another until no one would be willing to assume the authorship. A great many of the formulas given in encyclopedic works show that the authors were ignorant of the nature of the ingredients they used. Many formulas are impossible, having incompatibles from a chemical standpoint, a mistake that young doctors sometimes make in their prescriptions; then many are of foreign origin and the use of grain alcohol is referred to as if it were as cheap as petroleum naphtha; or potato-starch is used where we would use corn-starch for economy. The great bulk of them are very inferior in usefulness and a limited number are impracticable. It has been my endeavor to pick out some of the best.

With regard to the literature on this subject a great deal of information may be had in the formula books, such as those of Spon, Wahl and Brannt, a long article in Muspratt's "Handwörterbuch der Chemie," and similar places. The engineering handbooks are practically barren of any information on this subject.

I have had such repeated occasion to use luting and cementing materials for various purposes in the laboratory and works that I thought some condensed information on the subject might benefit others if brought together.

They may be classified as follows: (1) Water and steamproof. (2) Oil-proof. (3) Acid-proof. (4) Proof to hydrocarbon gases. (5) Chlorine-proof. (6) Elastic. (7) General purposes. (8) Marine glue. (9) Gaskets. (10) Machinists'. (11) Leather (belting). (12) Crucible, iron and stone. (13) Core compounds. (14) Briquetting.

(1) Water-proof Compositions.—Of use to engineers are the asphalt fluid coatings for reservoir walls, concrete foundations, brick, wood, etc. Asphalt only partly dissolves in petroleum naphtha, but heated in a steam-jacketed kettle and not thinned out too much, a mixture of the two may be obtained in which the part of the asphalt not dissolved is held in suspension. Asphalt is entirely soluble in benzol or toluol which are about the cheapest solvents for all the constituents of asphalt. Tar and pitch are sometimes used in this connection, but tar contains water, light oils and free carbon, and does not wear as well as good refined asphalt; and pitch contains free carbon, which is sometimes objectionable when thinned out with a solvent. The asphalt alone is somewhat pervious to water, and this is improved by adding about one-fourth its weight of paraffin, and made better if in addition a little boiled linseed oil is added also. For thicker compositions, where body is required, asbestos, stone powder, cement, etc., may be added as fillers.

Lutes of linseed oil thickened with clay, asbestos, red or white lead, etc., are water-proof if made thick enough. These are much used for steam joints. Flaxseed meal made into a paste with water is often serviceable, the oil contained serving as a binder as the water evaporates.

(2) Oil-proof Compositions.—The most useful lute for small leaks, etc., is the well-known "hektograph composition," as follows:

	Parts.
Good glue or gelatin	2
Glycerine	1
Water	7

This is applied warm and stiffens quickly on cooling. Another very useful composition is a stiff paste of molasses and flour. Another preparation impervious to oil vapors is the "flaxseed poultice," mentioned in Sec. 1, which is proof to oil vapors.

One of the strongest cements, and one which is really oil-proof, waterproof and proof to almost everything, is a stiff paste of glycerin and litharge. These form a chemical combination and set in a few minutes. If a little water is added, it sets more slowly, which is often an advantage. It is mixed when required for use. Plaster of Paris wetted, by itself, or mixed with asbestos, straw, hair, etc., is useful. A solution of silicate of soda made into a stiff paste with carbonate of lime, gets hard in six to eight hours.

(3) Acid-Proof Compositions.—The asphalt compositions already mentioned, compositions of melted sulphur with fillers of stone powder, cement, sand, etc., also the following, which withstands hydrochloric acid vapors:

	Parts.
Rosin	1
Sulphur	1
Fire clay	2

The lute composed of boiled linseed oil and fire-clay acts well with most acid vapors. The composition of glycerin and litharge referred to is useful in this connection, especially when made up according to the formula of Geo. E. Davis, viz:

	Pounds.
Litharge	80
Red lead	8
"Flock" asbestos	10

fed into a mixer, a little at a time, with small quantities of boiled oil (about six quarts of oil being used). Sockets joined in 3-inch pipes carrying nitric acid were caulked with this and showed no leaks in nine months.

A particularly useful cement for withstanding acid vapors, being also tough and elastic, is:

	Parts.
Crude rubber, cut fine	1
Linseed oil, boiled	4
Fire-clay	6

The rubber is dissolved in carbon disulphide to the consistency of molasses and then mixed with the oil. Other examples of acid-proof cements, taken from "A Handbook of Chemical Engineering," by Geo. E. Davis, and vouched for by the author, who has used them in chemical engineering work, are as follows:

"Black putty," made by intimately mixing equal portions of china-clay, gas-tar and linseed oil. The china-clay must be well dried by putting over a boiler, etc. The author says that it is probable that anthracene oil might be used to advantage instead of gas-tar, for reasons which I stated in referring to asphalt lutes. It seems to me, however, that soft pitch or, better still, a semi-liquid asphalt or naphtha would be best.

Barytes cement is composed of pure, finely ground sulphate of barium, and is made into a putty with a solution of silicate of soda. This sets very hard when moderately heated, and is then proof against acids. Mr. F. E. Dodge has tried this and finds the gravity of the silicate of soda should be between 1.2 and 1.4, 24° to 42° Beaumè. If too thin, it does not hold; and when thicker than 1.4, it expands and breaks.

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[*] A paper read before the Philadelphia Engineers' Club, June 4, 1904.

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(4) Hydrocarbon Gases.—Compositions of plaster and cement, the former setting more quickly, are used. Also compositions of casein, such as:

	Parts.
Finely powdered casein	2
Fresh slaked lime	50
Fine sand	50

Water is added, when used, to form a thick mush. Various mixtures of silicate of soda are employed in which the thick silicate is absorbed in some inert material, as clay, sand or asbestos.

(5) Chlorine.—The best and only reliable compositions are a few made with Portland cement, and the following is much used for electrolytic and chemical plants:

	Part.
Powdered glass	1
Portland cement	1
Silicate of soda	1

A small amount of powdered slate.

This lute is said to stand acid and alkali, as well as the influence of chlorine. Linseed oil made into a paste with fire-clay serves for a time.

(6) Elastic Cements.—The various cements containing rubber are elastic, if it is in predominating amount; many containing boiled linseed oil and the hectograph composition already mentioned are quite elastic. The rubber-linseed oil cement, given under Sec. 3, is very tough and useful for nearly all purposes except when oil vapors are to be confined. The most useful single rubber lute is probably the so-called Hart's india-rubber cement. Equal parts of raw linseed oil and pure masticated rubber are digested together by heating and this mixture made into a stiff putty with fine "paper stock" asbestos. I have found it more convenient, however, to dissolve the rubber, first in carbon disulphide, and after mixing the oil with it, to let the solvent evaporate spontaneously.

(7) General Purposes.—One of the most useful is plaster of Paris, and especially when mixed with asbestos, straw, flush trimmings, hair, broken stonè, etc., used according to temperature, strain and other conditions. A putty of flour and molasses is a good composition to keep in a works ready for quick application when needed. It serves almost any purpose at moderate temperatures for a time. Casein compositions have great strength.

White of egg made into a paste with slaked lime is strong and efficient, but must be used promptly on account of its quick setting qualities.

(8) Marine Glue.—This can be purchased almost as cheaply as made. The rubber must first be dissolved in carbon disulphide or turpentine before mixing with the heated combination of the other two ingredients. Its uses are well known.

	Parts.
Crude rubber	1
Shellac	2
Pitch	3

(9) Gasket Compositions.— Of course, almost any cementing substance may be used with rings of asbestos, etc., for gaskets, but there are some that I have used and which I have known others to choose especially for that purpose.

With regard to asphalt, tar, pitch and petroleum residuum, I would recommend soft or hard pitch, as may be desired, because there are no light oils or water to go off at low heats, and the free carbon and compounds very high in carbon are good fillers to asbestos gaskets at high temperatures. Silicate of soda by itself is much used, but is sometimes advantageously mixed with casein, fine sand, clay, asbestos, carbonate of lime, caustic lime, magnesia, oxides of heavy metals, such as lead, zinc and iron, and powdered barytes. A few that might be selected are—silicate of soda and asbestos; silicate of soda, asbestos and slaked lime; silicate of soda and fine sand; silicate of soda and fire-clay.

(10) Machinists' Cements.—These are the well-known red and white leads. The red lead is often diluted with an equal bulk of silicia or other inert substance so as to make it less powdery. The best way that I have found to do this, however, is to add rubber or gutta-percha to the oil as follows:

	Parts by weight.
Linseed oil	6
Rubber or gutta-percha	1

The rubber or gutta-percha is dissolved in sufficient carbon disulphide to give it the consistency of molasses, mixed with the oil, and left exposed to the air for about 24 hours. The red lead is then mixed to a putty. Oxide of iron makes a less brittle cement than red lead. Probably fish oils and red lead would make good lutes of the class for joining pipes, as the fish oils are not such strong drying oils as linseed, and their use might be a case of permissible substitution rather than adulteration.

(11) Leather Cements—(For leather belting.) This subject is treated fully and well in the literature, and I only quote some formula for the convenience of the readers of this paper. Those I select seem to be the cheapest, and from a knowledge of the chemistry of the subject, the best. The following formula are given in the "Papier Zeitung," vol. 18, p. 2618:

(1) Equal parts of good hide glue and American isinglass, softened in water for ten hours and then boiled with pure tannin until the whole mass is sticky. The surface of the joint should be roughened and the cement applied hot. (2) One kilo of finely shredded gutta-percha digested over a water bath with 10 kilos of benzol, until dissolved, and 12 kilos of linseed oil varnish stirred in. (3) 7½ kilos of finely shredded India rubber are completely dissolved in 10 kilos of carbon disulphide by treating whilst hot, 1 kilo of shellac and 1 kilo of turpentine are added, and the hot solution heated until the two latter ingredients are also dissolved.

Another one noticed in the "Journal of the Society of Chemical Industry" seems to be good:

	Ounces.
Gutta-percha	8
Pitch	1
Shellac	1
Sweet oil	1

These are melted together.

A formula from Spon's "Dictionary of Workshop Receipts" is about as follows: Fish glue is soaked in water 24 hours, allowed to drain for a like period, boiled well and a previously melted mixture of 2 oz. of rosin and ½ oz. of boiled oil is added to every 2 lbs. of glue solution. I have not verified any of these formula for leather cements.

(12) So-Called Iron, Stone and Crucible Cements.—These are all hard, stone-like compositions. The oxychloride cements, consisting essentially of oxychlorides of magnesium and zinc, are very hard and are much used in engineering construction.

Stone Cements. — The formulæ which I give in my previous paper are:

	Parts.
Zinc oxide or magnesium oxide	2
Zinc or magnesium chloride	1
Water to make a paste.	

When dry these become very hard and strong. Powdered stone is generally used as a diluent.

Iron Cements.—When iron in a fine state of division, as in fresh filings or cast-iron borings that have been powdered, is mixed with an oxidizing agent, such as manganese dioxide, or a substance electro-negative to iron, such as sulphur, in a good conducting solution like salt or salammoniac, galvanic action sets in very rapidly, and the iron swells, by forming iron oxide, and cements the mass together. It is best diluted with Portland cement. A formula which I give from memory is:

	Parts.
Iron filings	40
Manganese dioxide, or flowers of sulphur	10
Salammoniac	1
Portland cement	20 to40
Water to form a paste.	

These cements are used extensively in foundries, etc.

Crucible Cements.—Mixtures of clay and borax in which the clay predominates. Silicate of soda and powdered glass or sand are the best known compounds for cementing lids on crucibles, etc. Sometimes the "iron cements" are used for such purposes, or iron filings and a little manganese dioxide are added to the above compositions for crucible cements.

(13 and 14) Core Compounds and Briquetting.—These may be treated together, as their actions are closely analogous. Some of the substances used for briquettes are: Dextrin, spoiled potatoes, grain and starchy materials, molasses, glucose, clay, sand, loams, bituminous coal, pitch, asphalt and tar, Oxychloride cement and Portland cement.

Most of these have also been used as core compounds, those most advantageously employed being probably flour, or meal of some kind, dextrin and molasses.

Briquetting requires more of a binder than is necessary for cores, and the evolution of gas is not so important; in fact, some briquette compositions use enough binder to supply carbon and reducing gases to effect a reduction of the oxides of the ore.

There are cements for various miscellaneous purposes, but the most important uses of interest to engineers have been briefly treated in this paper. A limited number, if carefully selected, would be found to answer all requirements, and it is often desirable to have a few prepared that can be used on short notice.

Discussion.

E. M. Nichols—Could fish oil be used in ordinary steamfitting, in connection with red lead or linseed oil?

Mr. Sadtler—Yes; it has recently occurred to me that an oil with milder drying properties than linseed might be better. Corn oil might be good for the purpose. Linseed oil gets brittle and powdery with red lead, as is noticeable when the pipes are taken apart.

Mr. Nichols—My experience with cements used for steamfitting is that the more quickly they dry, the more perfectly they fill up any imperfections that exist in the thread of the pipe or of the fittings, and we do not desire as elastic material. There is also another purpose, as a lubricant, which will enable the workman to screw the pipe into the fitting much easier than would be done if it was not there. If the fittings and pipe are fairly accurate plumbago and linseed oil will prove very satisfactory, although some engineers specify nothing but red lead and oil.

THE CEMENT INDUSTRY.

The United States Geological Survey has issued the following statement regarding the production of hydraulic cement in the United States for the calendar year 1904:

The total production of Portland natural rock, and slag or Puzzolan cements in 1904 was 31,675,257 barrels, valued at $26,031,920. These figures show a marked falling off in price when compared with prices for 1903. The production for 1903 amounted to 29,899,140 barrels of hydraulic cement, valued at $31,931,341. In the production for 1904 there is a gain of 1,776,117 barrels over that for 1903, but in the value of the cement produced there is a loss of $5,899,421.

Of the total amount of cement manufactured in the United States in 1904, 26,505,881 barrels were Portland cement, valued at $23,355,119; 4,886,331 barrels were natural rock cement, worth $2,450,150; and 305,045 barrels were slag or Puzzolan cement, with a value of $226,651.

INCORPORATIONS.

The Jamestown Hollow Cement Stone Company has been incorporated with a capital of $5,000. The plant will be located in East Jamestown, N. Y.

The Cement Ventilating Building Block Co., Columbus, Ohio, change of name to the Cement Ventilating Stone Co., and increase of capital stock from $5,000 to $10,000.

The Union Cement Company, Louisville, Ky., filed articles of incorporation in the office of the county clerk, with a capital stock of $6,000, divided into shares of $100 each. The maximum indebtedness is fixed at $15,000. The incorporators are as follows: Simon Sapinsky, Julius Sapinsky and Joseph E. Hays, each holding twenty shares of stock.

The George E. Mercer Cement Block Company of Bowling Green, Columbus, Ohio, capital, $10,000. Incorporators: George E. Mercer, J. E. Kelly, A. E. Avery, B. F. Stulley and J. M. Hitchcock.

Commercial Concrete Block & Building Company, Milwaukee, Wis.; capital, $25,000. Incorporators: Daniel E. Smith, F. T. Southcr, John Funck.

St. Louis Cement Roofing and Block Stone Company, St. Louis, Mo.; capital, $15,000, 60 per cent paid up. Incorporators: Lena Roos, 1,400 shares; Everette Henegar, 90; Augus Roos, 8; Ambrose E. O'Hagen and Martin J. Casey, 1 each.

The Sydney Cement Co., Sydney, Nova Scotia; capital, $500,000. Object, to manufacture cement.

Economy Mfg. Co., New Haven, Conn.; capital, $5,000. Object, to manufacture stone and cement. Incorporators: Edwin S. Wheeler, James E. Wheeler and Carl E. Harcke.

St. Joseph Concrete Stone Co., St. Joseph, Mo.; capital, $10,000.

Southern Architectural Cement Stone Co., Dallas, Texas; capital, $10,000. Object, manufacturing concrete building blocks.

Streeter Central Block Company, Keokuk, Iowa; capital, $10,000; C. D. Streeter and others, incorporators.

Watertown Concrete Stone Co., Felts Mills, N. Y.; capital, $30,000. Objects, to manufacture hollow concrete blocks and building supplies. Directors: Geo. E. Cord, Josephine Cord and Mason M. Swan.

Geo. L. Smith Co., Wausau, Wis.; capital, $10,000; objects, to manufacture cement stone, brick and building supplies, and transact a general contracting business. Incorporators: Geo. L. Smith and Louis Locklin.

Corona Cement Co., Kittery, Me.; capital, $1,000. Objects, to manufacture cement sands. President, O. S. Paul, and treasurer and clerk, J. E. Forsyth.

Oakland Concrete Stone Manufacturing and Construction Co., Lincoln, Neb.; capital, $5,000. Incorporators: Peter Palmer, Theodore Johnson and John Hansen.

M. F. Hickey Company, Brooklyn, N. Y.; capital, $5,000. Objects, to deal in cements. Directors: M. F. Hickey, Annie A. Hickey and J. L. Hickey, all of Brooklyn.

Concrete Block Construction Co., Albany, N. Y.; capital, $5,000. Object, concrete blocks. Incorporators: A. W. Furnevill and A. Sondheimer, Astoria, N. Y.; J. T. Emery, New York.

Standard Cement Co., 614 Monroe street, Hoboken, N. J.; to deal in cement; capital, $5,000. Incorporators: Harry B. Ayers, Fourth street, Union Hill, N. J.; Benjamin Banner, 341 Anns avenue, New York; Philip Ostermayer, 184 Webster avenue, Jersey City Heights, N. J.

Marshalltown Sidewalk and Concrete Co., Marshalltown, Iowa; capital, $10,000. C. A. Buchwold and others incorporators.

THE JANESVILLE CEMENT POST.

The cement fence post is one of the new lines of manufacture which has been developed within the last few years in various parts of the United States. The market for these posts is still undeveloped, when compared with the great demand which now exists for the wood post, principally cedar, one of the leading railway companies with general offices at Chicago having purchased in a single year 750,000 wooden posts, to be used on its right of way. While these posts have an average life of fifteen years before they must be replaced, yet from 25 to 40 per cent are destroyed by fire. The growing scarcity of wood and this high fire waste has compelled railway companies to investigate some suitable substitute, such as steel, terra cotta and cement. The reinforced cement post is being tested on several lines of railway with excellent results. These posts are fireproof and practically indestructible by the elements, which can be said of no other material with which they compete. The Janesville Cement Post Co. of Janesville, Wis., is the largest manufacturer in this line in the United States. The dimensions of their factory are 767 by 87 feet, the interior of which is shown in Fig. 1. The plant has a daily capacity of 5,000 posts and has been in successful operation four years. One hundred thousand of their posts are now in use. Experience shows that posts set four years ago have constantly improved with age. The regular line post is reinforced with three large cables composed of two wires each, placed in the form of a triangle, imbedded in the concrete. The line posts, Fig. 2, are 7 feet long, while corner posts are 8½ feet long, weigh 310 pounds and are reinforced with eight long cables. The finished post is shown in Fig. 3. Fig. 4 shows two posts carrying four men and a horse. Fig. 5 illustrates the five different styles of posts made by the company and a section of fence in place. The factory is fully equipped with all of the latest appliances for making cement posts with the least manual labor. The company has its posts in use on farms, railway rights of way, as well as in cities and towns. The demand is constantly growing, especially among farmers, who praise cement posts in the strongest language.

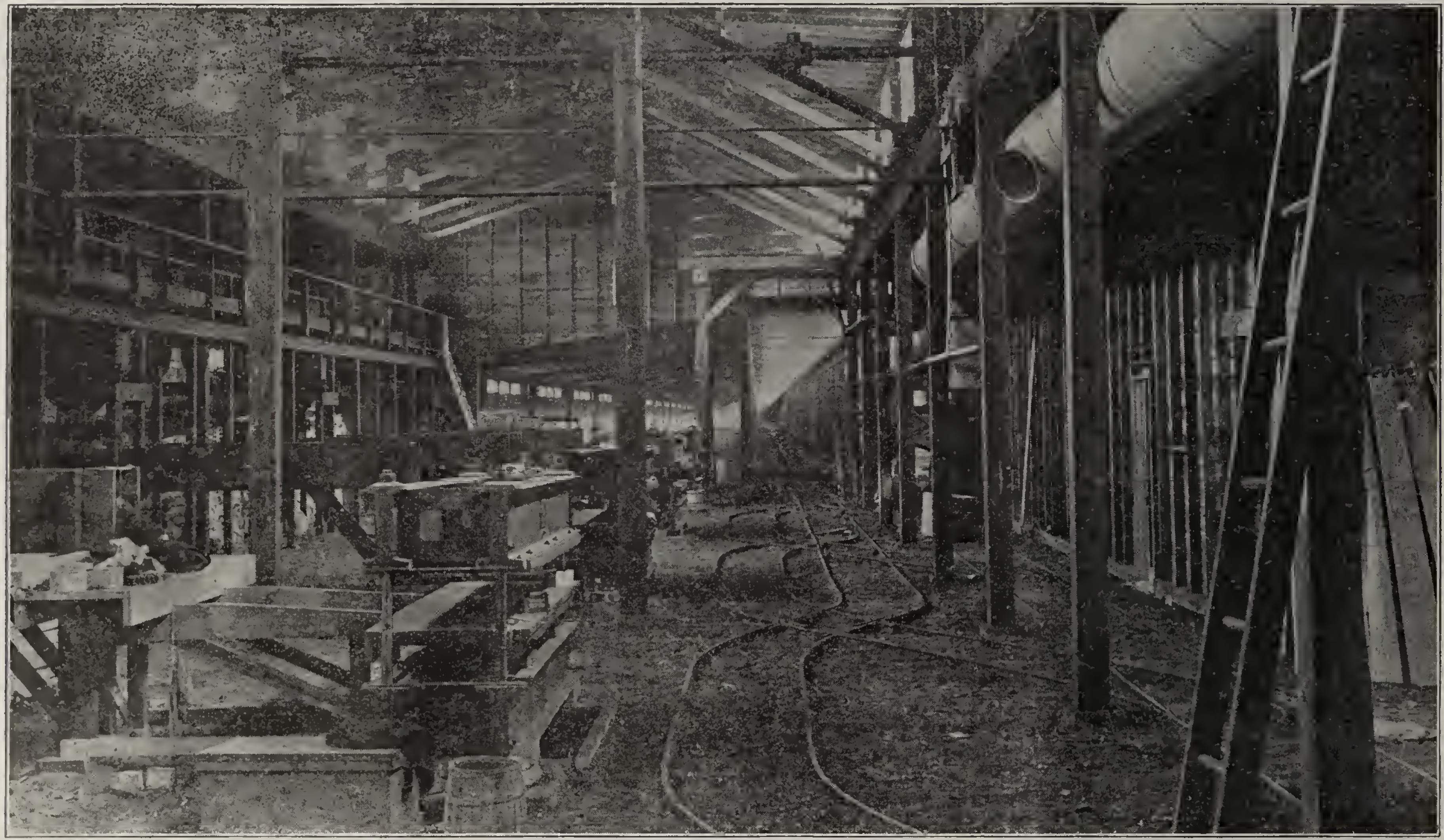


Fig. 1. Interior View Janesville Cement

CEMENT POSTS.

The item of fence posts has become an important consideration on many farms, where the timber supply has been exhausted. In many places it is almost impossible to go out and buy posts at anything like reasonable figures. So we see on farms here and there an attempt made to use substitutes for the wood post, such as steel, stone and cement. Iron and steel posts do not seem to be practical on account of their short life, as well as cost. Stone posts come high, unless it is convenient to have them quarried out on the farm nearby. The cement post comes nearer filling the bill and supplanting the wood post than anything else

The Central Cement Association has agreed to raise the price of marl cement 10 to 15 cents per barrel. The association is composed of seventeen cement companies that manufacture marl cement in Michigan, Indiana and Ohio. Cement under the increased price to dealers will be about $1.21 per barrel.

Richard Kind, manager of the Toledo Builders' Supply Company, says that the increase in price of marl cement has long been looked for by the trade. "There have been so many cement factories started in the past few years," continued Mr. Kind, "that the industry has become demoralized and many plants in the middle west have been shut down because the owners were losing money. It costs $1 a barrel to manufacture the product, so that when they sell to jobbers at Detroit for $1.20, after paying the freight from their plants to the City of the Straits you can see how much money there is in it, even at the increased price. Why, we are selling all the cement for the new Nicholas building to the Bentleys for $1.19 a barrel. An increase in price was inevitable."—Toledo Blade.

The Glens Falls Portland Cement Co. has given a trust deed on property in Warren and Saratoga counties, N. Y., to secure $400,000 6 per cent gold bond issue. Russell A. Little and Louis M. Brown are the trustees.

A. E. St. Clair and son will manufacture cement fence posts at Vinton, Benton Co., Iowa.

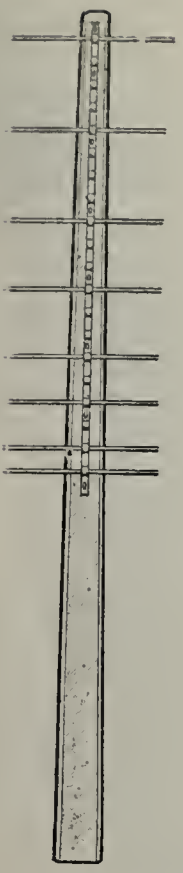


Fig. 2. Line Post.

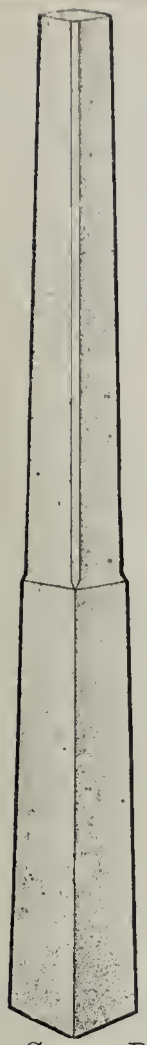


Fig. 3. Corner Post.

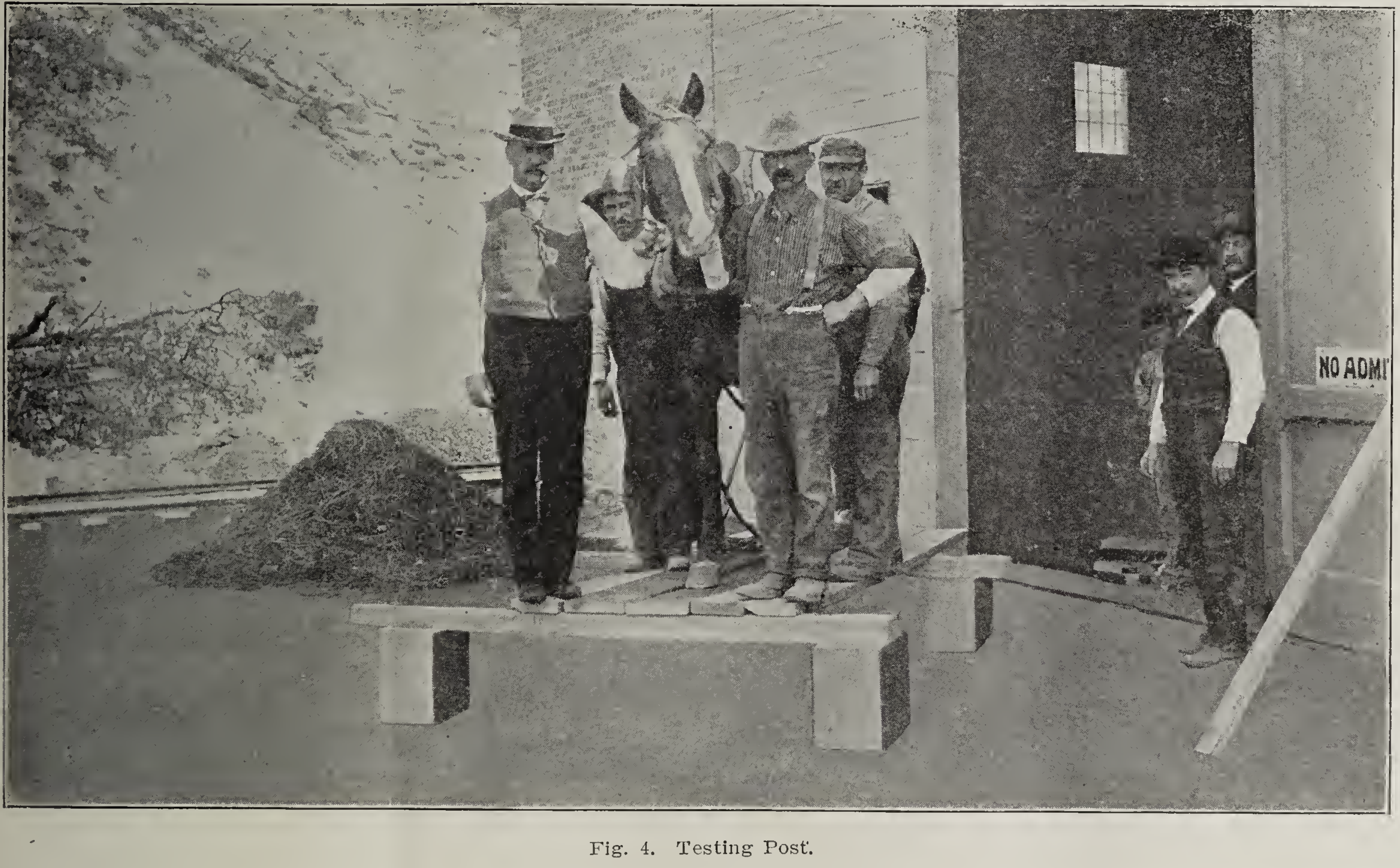


Fig. 4. Testing Post.

A hollow concrete building factory has been established at Berne, Adams Co., Ind., known as The Berne Artificial Stone Factory. Abraham Boegly, proprietor. There are similar factories in the same county at Decatur, Geneva and Linn Grove.

Armour & Co. will erect a reinforced concrete office building at the Chicago Stock Yards to cost $250,000. The external walls, skeleton and floors throughout will be concrete.

MEDUSA WATERPROOF COMPOUND.

The Sandusky Portland Cement Company of Sandusky, Ohio, has placed upon the market a compound for rendering concrete work waterproof. From one to two pounds of the compound mixed with one bag of Portland cement and five parts sand gives a more impervious mortar than ordinary untreated cement with two parts sand. The compound is first thoroughly mixed with the dry cement before the addition of sand and water. It is especially useful for waterproofing cement building blocks, roofing tile, cisterns, cellar walls, conduits, and wherever watertightness is desired in concrete.

The addition of the compound likewise prevents effloresence and hair cracks. The Medusa Waterproof Compound can be purchased at ½c per pound in 40-pound paper sacks, f. o. b. Sandusky, Ohio. Sample package of 4 pounds, sufficient to treat 1 barrel of cement, will be shipped by express, collect, on receipt of 50 cents.

H. H. Hall of Ashtabula, Ohio, has erected the first hollow concrete dwelling house in that vicinity. The dimensions are 30x65 feet and three stories high, divided into two parts of twelve rooms each.

The Gadsden Tile & Paving Co., Gadsden, Ala., has been organized to manufacture hexigon cement tiling.

The rights to a large tract of cement land near Mobile, Ala., have been secured by C. S. Bachelder of Salt Lake City and W. J. McIntyre of St. Louis. They paid the state $15,000 for the same. It is proposed to organize a million dollar company to make cement.

A cement roof tile factory is to be established at Wausau, Wis., to manufacture under the D. J. Murray patents.

The Empire Portland Cement Works, Warner, N. Y., will resume operations and will employ about 150 men this summer.

An accident at the Lawrence Portland Cement Works at Siegfried, Pa., caused by the falling of a 75-foot stock, which was being erected, injured four men. The hook on the block conveying the suspended stock broke while the stock was 65 feet in the air, near kiln building No. 7, resulting in the injury to the men.

The Aetna Portland Cement Co. has shut down, due to an accident to one of the large tandem engines being wrecked. The piston being driven out through the cylinder heads caused by a flaw in the piston rod. Several flues in a water tube boiler were blown out about the same time, causing a complete shut down of the mill.

Glens Falls Portland Cement Co. are contemplating the installation of rotary kilns to take the place of the old style upright kilns now in use.

J. Frank Dye, of Newport, Ky., has organized a company to manufacture cement. The proposed plant is to be located on the Watertown road near the Newport corporation line.

The Carlisle Building Block Co. of Carlisle, Pa., has just received ten carloads of Portland cement to be used during the coming season.

Western Portland Cement Co., Yankton, S. D., has been awarded the government contract to supply cement for the Belle Fourche irrigation ditch. At least 200,000 barrels of cement will be needed.

Walter S. Harsha, special master in chancery, has given notice that by an order of the circuit court of the United States for the eastern district of Michigan, he will sell to the highest bidder at the court house in Bay City, Mich., Wednesday, June 7, 1905, all the property of the Hecla Portland Cement & Coal Co. mentioned in the bill of complaint of the Detroit Trust Co., complainant, against the Hecla company and other parties made defendants in the suit started to clear up the affairs of the principal defendant. All the property will be offered in one lot and sold, but no bid will be received and accepted of less than $950,000, and no bids will be received unless the party tendering the same shall deposit with the special master previous to the sale the sum of $50,000 in cash or certified check. Other conditions are made to hold the bidder.

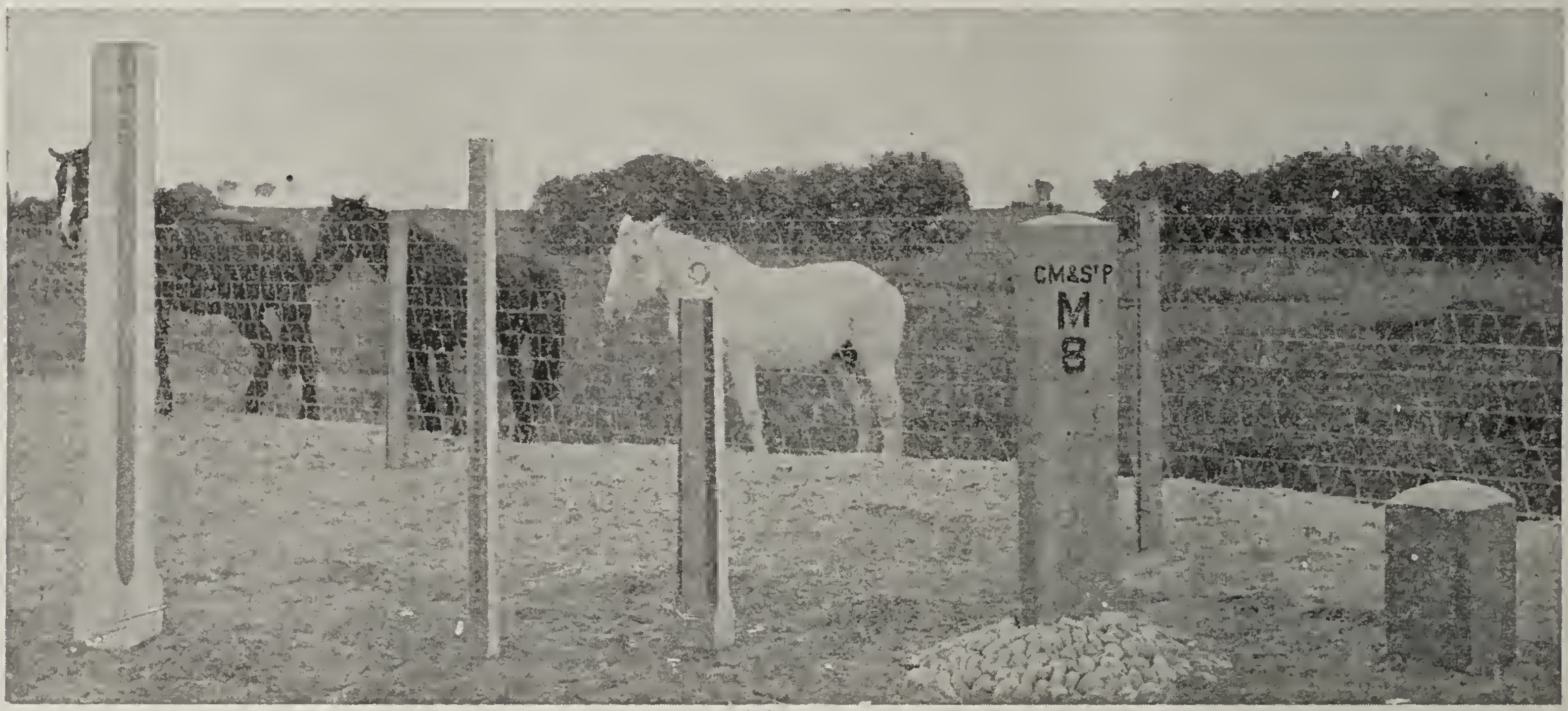


Fig. 5.

Corner Post. Line Post. Hitching Post. Mile Post. Cemetery Post.

The sale of the property will be of interest to the people of Bay City as it means that the purchasers will begin the operation of the plant, giving employment to a large number of men.

Chas. Roe, formerly of Pontiac, Mich., now president of the Furman Construction Company of Detroit, proposes to locate a plant for the manufacture of a standard German cement tile at Pontiac to be known as the Detroit Cement Tile Co. Mr. Roe states that there are now 267 cement tile factories in Germany. The company exhibited its cement tile at the last Michigan state fair and were awarded the blue ribbon prize for their exhibit. The company expects to employ from 30 to 50 men and invest from $10,000 to $25,000. Ten tile machines are to be installed to manufacture these tiles.

The Portland Cement Construction Co. of Milwaukee, Wis., has gone into the hands of a receiver.

St. Ignace, Mich., citizens have offered a free site for a proposed cement plant. Joseph J. Works of the same place is said to be interested in the proposed plant.

Bankruptcy proceedings have been commenced against the Eureka Cement Co. of 141 Broadway and 1 Madison avenue, New York, by the following creditors: Howard Conkling, $1,029; Cary B. Fish, $290; the Phoenix Cement Co. of Nazareth, Pa., $6,779. It is alleged that on March 8 a receiver was appointed for the company in the Supreme Court on the application of the John P. Kane Co., a judgment creditor. The company was incorporated on Nov. 28, 1900, with a capital stock of $10,000. George R. Manchester, former secretary of the Republican county committee and afterward secretary of the New York State Canal Commission, was secretary of the company. Albert V. Brett, the treasurer, died suddenly on April 26, 1904. About two years ago the company became involved in a dispute with the dock department over a cement contract. The liabilities are estimated at $25,000.

Jas. Ladd of Portland, Ore., and A. Hart McKee of Pittsburg, Pa., claim to represent a syndicate which has located raw materials for the manufacture of Portland cement near Chittenden, Santa Cruz Co., California, on the Southern Pacific Railway. The promoters state they will erect a cement plant at Chittenden and bid on cement contracts for the Panama canal work.

The following parties are promoting a Portland cement plant, to be located north of Gas City, Kan.; John E. Logan, Thos. J. Anderson, Gas City, Kan.; Thos. M. Morrow, Denver, Colo.; Wm. C. Nelson, Montgomery City, Mo.

The Broadway wharf at San Francisco, Cal., built by the Hyde Construction Co. for the state three years ago at a cost of $200,000, has been found defective and not constructed in accordance with the plans and specifications, which called for the driving of a cluster of piles to be surrounded by a ring of street piling of sufficient diameter to admit encasing each pile cluster with a heavy casing of concrete carried down into the mud to protect the pile from the attack of the toredoes. Several of the pile clusters not having been encased in concrete have been totally eaten away by the toredoes, which leaves a portion of the dock without supports. The Hyde Construction Co. claim this work was done at night by an irresponsible foreman and without their knowledge and in the absence of the state inspector.

The Iroquois Portland Cement Co. of Caledonia, N. Y., will spend $50,000 for improvements in its plant.

The Christian Church Society will erect a new church of hollow concrete building blocks six miles east of Bluffton, Indiana.

Fuge & Kesting of West Bend, Wis., will erect a factory building for the manufacture of concrete building blocks.

M. D. Woodford of Cincinnati will erect a seven-story reinforced concrete mercantile building on Walnut and Lippincott streets.

The Goodell-Pratt Co., Greenfield, Mass., will erect a reinforced concrete building, 42x42 feet and three stories high.

The McKeesport Cement Tile Co. of McKeesport, Pa., are manufacturing cement roof tile at their factory on Pacific avenue. The new mills of the National Tube Co., which are to cost $10,000,000, have decided to give the cement tile a trial and if the test proves satisfactory the tile company may be given the entire roofing contract for tube company's mills.

Mr. U. G. Johnston, manager of the Cement Tile Company, states that a large number of orders have been received for cement roofing tile, which is now being manufactured.

The Union Cement Company of Louisville, Ky., filed articles or incorporation, a capital stock of $6,000, divided into shares of $100 each. The maximum indebtedness is fixed at $15,000. The incorporators are as follows: Simon Sapinsky, Julius Sapinsky and Joseph E. Hays, each holding twenty shares of stock.

The Trinity Episcopal Church of Wheeling, W. Va., will use concrete building blocks in the first story of the church edifice.

The Farmington Stone & Sidewalk Co. of Farmington, Minn., is manufacturing cement building blocks, in colors, blue, black, brown and red, and are prepared to produce other colors on demand.

Bay City, Michigan, spent more for cement sidewalks than for sewer construction in 1904.

The Pettit Cement Works of Everett, Wash., has commenced the manufacture of cement coffins.

The Fredrick Concrete Block & Cement Co. has been incorporated. Capital $5,000. Head office, Fredrick, Md.

At the annual meeting of the Wolverine Cement Co., at Coldwater, the net earnings for the past year were $62,000. Of this, $37,000 will be charged off for depreciation to plants, $35,000 will be expended in lengthening the fourteen rotaries of the plants at Quincy and Coldwater, from 60 to 90 feet. The product of the company for the year was a little less than 500,000 barrels. The directorate has been increased to seven, the new members being C. C. Jones of Quincy and Frank M. Rudd of Bronson and D. C. Rexford of Detroit, Mich.

Incorporated: Cedarville Artificial Stone and Cement Company of Ft. Wayne, Ind. Capital, $25,000. Directors, A. H. Bettinger, Charles C. Adams, Charles H. Thomas, Elmus R. Gesaman and Amos E. Houk.

The Horton Concrete Co. of Iola, Kan., have orders for 10,000 concrete blocks on their order book.

George E. Mercer Cement Block Co., Bowling Green, Ohio; G. E. Mercer, J. E. Kelly, A. E. Avery, B. F. Stuller, J. M. McClintock. Capital $10,000.

The Edison Cement Company expect to have its plant in full operation by April 15.

The Bluffton Cement Block Company, Bluffton, Ohio; capital, $3,000. Incorporators: John Locher, G. P. Oberley, John Bixel, Moses Steiner and John Felt.

The Giant Manufacturing Company, Rochester, N. Y.; object, to manufacture cement block making machines, etc.; capital, $5,000. Incorporators: J. N. Rauber, J. W. Stone and Robert Seibert, all of Rochester, N. Y.

City Construction Co., Indianapolis, Ind.; objects, to manufacture and construct cement curbing and sidewalks, etc.; capital, $10,000.

The Waukesha Lime & Stone Company, Waukesha, Wis.; capital, $50,000. Incorporators: P. J. Meyers, E. Bentzon and John O'Laughlin.

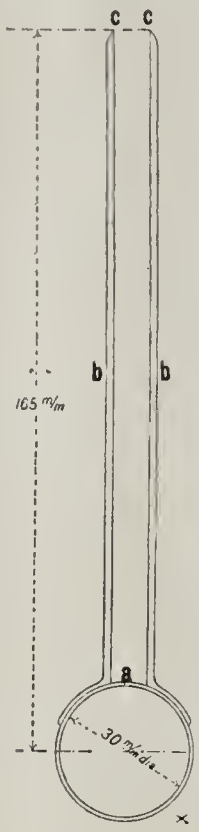
The Mobile Concrete and Building Block Co., Crichton, Mobile Co., Ala.; capital, $10,000. Object, manufacturing concrete blocks. Incorporators: J. A. Etikes and Thomas F. Costello.

Cement Block and Construction Company, Neola, Iowa; capital, $500. J. H. Cupp and others, incorporators.

The Taylor Construction Co., Cornwall-on-Hudson, N. Y.; object, to manufacture building blocks, etc.; capital, $100,000. Incorporators: John J. Taylor, William R. Taylor, Clark J. Brown, Cornwall-on-Hudson, N. Y.

Eastern Pennsylvania Stone Co., Dover, Del.; capital, $100,000. Object, to manufacture cement.

CONSTANCY OF VOLUME TESTING APPARATUS.



We illustrate a new English device for testing the constancy of volume of neat Portland cement mortar. It consists of a short thin metallic cylinder 1 1-5 inches diameter and of same identical length, with two arms or pointers, b, b, 6 3-5 inches long riveted to the shell. The cylinder is slit from end to end at a, midway between the arms b, b,

In making a test the tube is set on end on a plate of glass and filled with cement mortar, care being taken that the slit is then covered with glass plate, upon which a weight is placed. The test piece thus protected is placed in a water bath in which the temperature is mained between 56.1 to 63.5 F. for 24 hours, after which it is removed and the distance between the pointers at c, c, are measured for expansion, which must not exceed 12-25ths of an inch. The test piece is again immersed and kept 24 hours in air, when it is measured at c, c, where the expansion must not exceed 12-25ths of an inch. The test piece is again immersed in water, which is brought to the boiling point in 30 minutes, and the boiling is continued for six hours, after which the test piece is again removed and kept in air for seven days and the expansion again measured at c, c, on the pointers. The difference in the two measurements must not exceed one-quarter of an inch.

A reinforced concrete business block will be constructed at Cincinnati, Ohio, for the Live Oak Distilling Co. The dimensions of the new structure will be 42 feet front on Broadway by 135 feet on Ninth and a frontage of 50 feet on Eggleston avenue. On Eggleston the building will be five stories high, with basement, and on Broadway four stories. The building is to cost $50,000, provision having been made for additional stories should more room be required. Architect Gustav W. Drach, Union Trust Building, Cincinnati, is preparing the plans.

Harrison Simmons claims to have located cement rock on his farm three miles west of Portsmouth, Ohio. He proposes to organize a cement company to develop the deposit.

Diamond Cement Block Company, Huron, S. D.; capital, $100,000.

BOOK REVIEW.

Cement and Concrete, by Louis Carlton Sabin, B. S., C. E., assistant Eng. Eng. Dept. U. S. Army, Mem. Am. S. Civil Engineers. 507 pages, 6x9 in. Cloth. Price $5.00. McGraw Publishing Co., Publishers. New York City.

This is an eminently practical treatise, full of live data, based upon the best modern practice in the use of concrete. The work is divided into 22 chapters, is well arranged to enable the reader to conveniently locate the data sought by consulting the index, which is comprehensive.

The treatise covers almost every kind of concrete work from the cement sidewalk to the massive dams and military fortifications, with method and cost of work. The properties of cement and methods of testing, chemical and physical, preparation and properties of mortar and concrete, character of sand, its shape and hardness of grains. The cost of making mortar and concrete, with tables. Hand and machine mixing, number of men and output.

The selection of materials and their value in concrete are thoroughly discussed. Water-proofing cement. Work with formulas for waterproofing compounds. Effloresence, its cause and remedy. The work is so eminently practical that we heartily recommend it to all who desire to the fullest information on the subject of concrete and its application in modern building constructions.

The Fairmont Cement & Manufacturing Co., Fairmont, Maine; capital, $10,000. Objects, to manufacture sidewalk blocks, building blocks and fence posts.

The Bangs-Gaynor Cement & Plaster Co., Fayetteville, N. Y.; objects, manufacturing cement, etc.; capital, $100,000. Incorporators: M. R. Bangs, W. T. Gaynor and P. H. Chechane, all of Fayetteville.

Tri-State Post and Fence Company of Madison, Ind.: capital, $25,000. Directors: Henry Wagner, Robert G. Glasso, Bert Wagner, Calvin Cranfill, John F. Wagner and William Wagner.

The American Concrete Stone Company, Cleveland, Ohio; capital, $10,000. Incorporators: Frank C. Caine, Frank N. Anderson, Geo. G. Sowden, Brewster P. Kinney, Kermode F. Gill.

Buffalo Bisulphite of Lime Works, Buffalo, N. Y.; capital, $100,000. Directors: E. O. Quigley, Greenwich, Conn.; Thomas M. Osborne and C. C. Avery, Auburn, N. Y.

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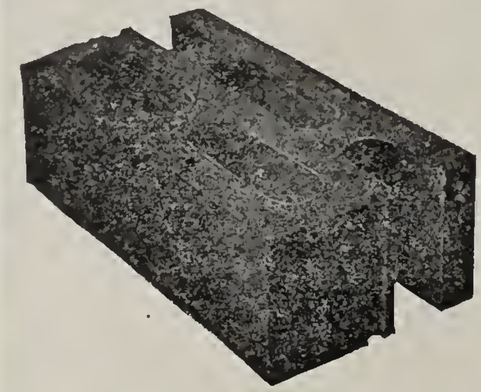

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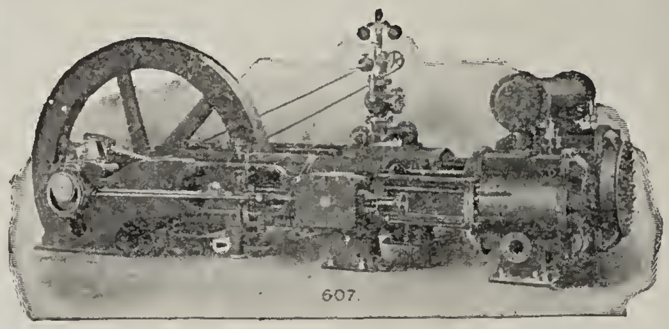

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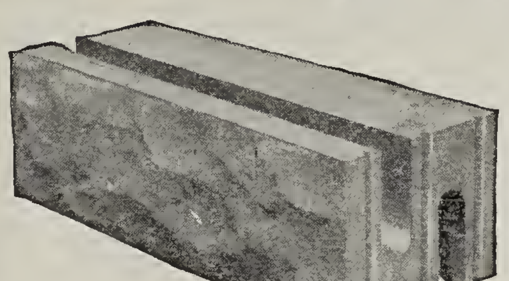

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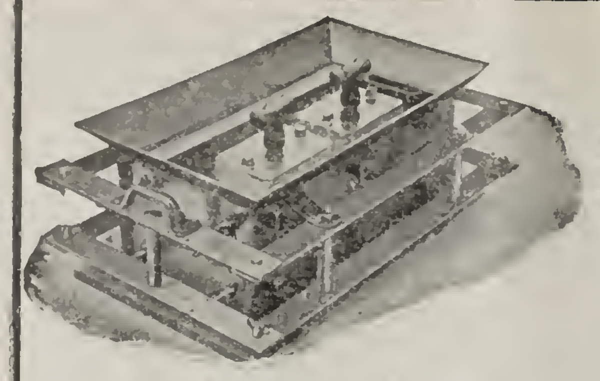

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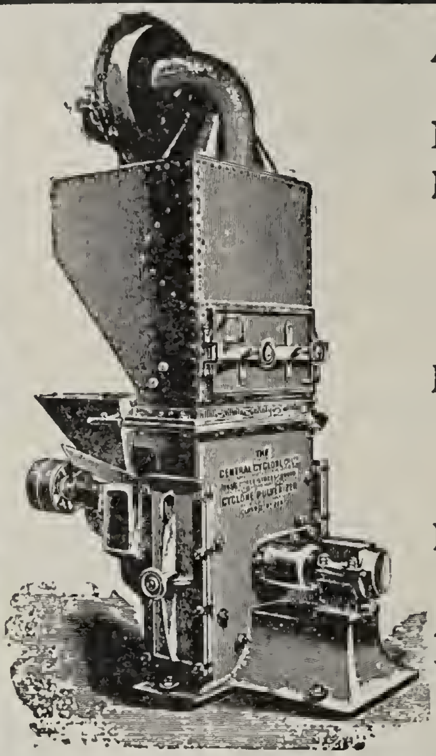

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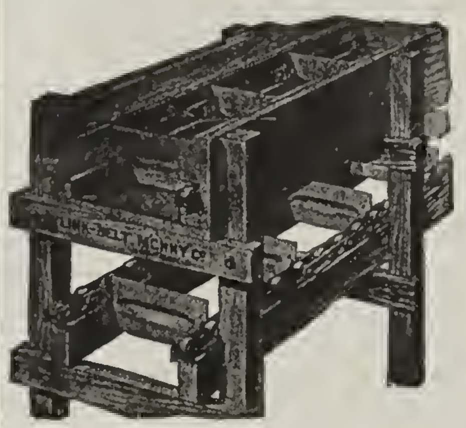

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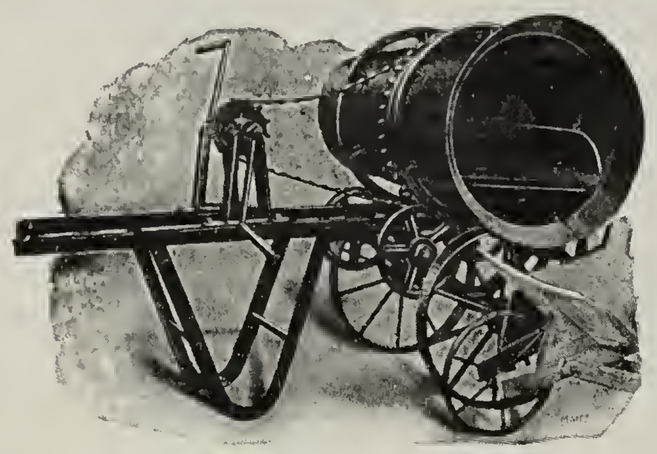

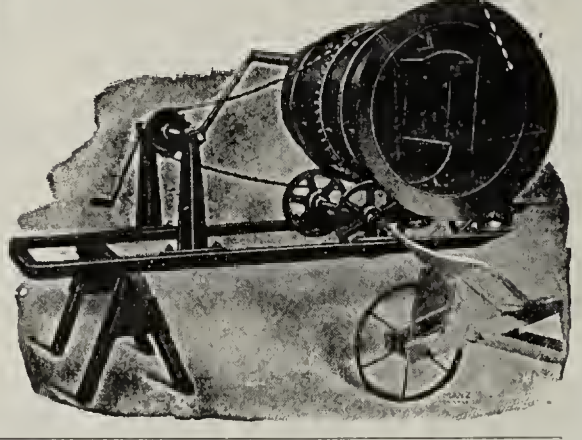

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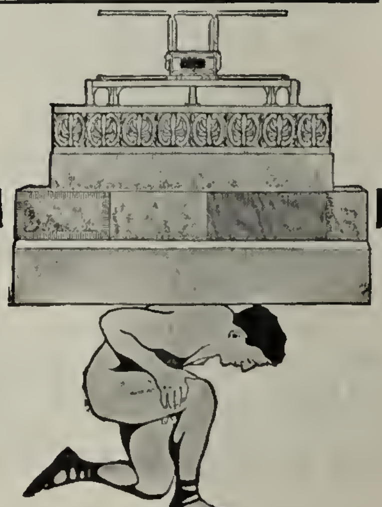

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Labor Saving DEVICES
ARE
"Century" Rubber Belt CONVEYORS
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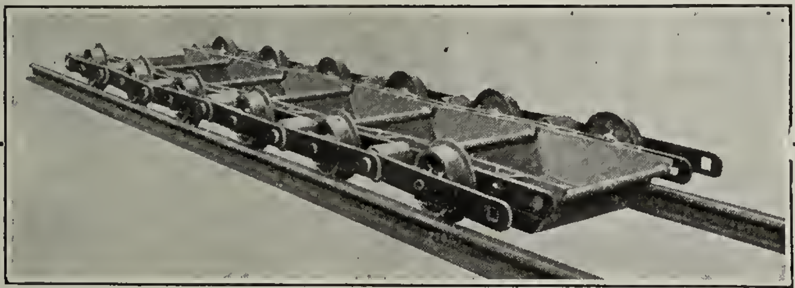

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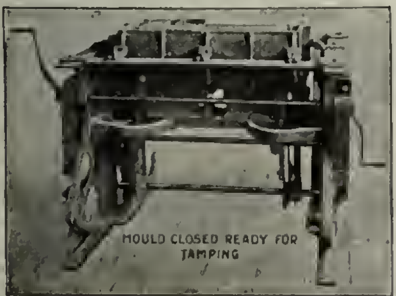

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FACING made easy and practical by means of tilting adjustment
FLUES clear bottom to top for ventilation, fire flues, piping or wiring
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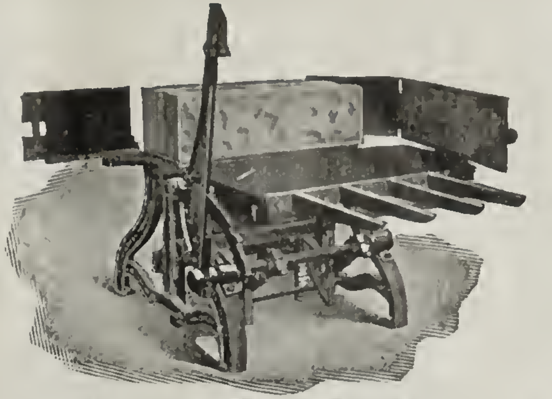

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The manufacture of

Normandin Hollow Concrete Building Blocks
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is a permanent and profitable business, broadening in extent every day.

Cheaper than good brick! Cheaper than stone! Cheaper than good lumber!

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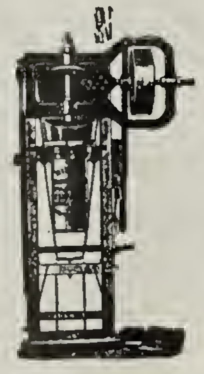

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STRONGEST, FASTEST AND MOST DURABLE FOR BARRELS.
MORE IN OPERATION THAN ALL OTHER MAKES COMBINED.
THE JEWEL IRON FRONT SACK PACKER.

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Established 1856.

You Build not for a Day but for 1,000 Years

By Using H. S. Palmer's Hollow Concrete Building Blocks

The Caldwell Residence, Springfield, Ill.

Approved by engineers, architects, and municipal corporations.—Absolutely water, fire, frost and vermin proof, giving ventilated walls, as well as conduits for water, gas and electricity and are positive non-conductors of heat and cold.

No cutting required. Produced by unskilled labor with the Palmer Hollow Block Machine at the rate of 300 to 400 cu. ft. per day.

A good business can easily be built up in every town, village and hamlet in the U. S., requiring only a moderate investment of capital.

Thousands of buildings of this construction have been erected, including warehouses, business blocks, factories and dwellings.

Wherever brick or stone are used for building purposes these blocks can successfully compete.

MACHINES AND TERRITORY FOR SALE

Write for full information. Agents Wanted.

Harmon S. Palmer, Originator of the Hollow Concrete Block System

WANTED—We Want the Name of Every Party Selling, Buying or Using any HOLLOW CONCRETE BUILDING MACHINES, as well as the Location of Every Building Erected with HOLLOW CONCRETE BLOCKS, Without Our License. For First Information We Will Pay a Reward. Address the Law Department of the Harmon S. Palmer Co., 1450 Binney St., Washington, D. C.

The United States Circuit Court for the Western District of Kentucky, at Owensboro, June 2, issued an injunction against Spayd and Bennett, restraining them from making or selling any machine or apparatus for making building blocks embodying or employing the inventions and improvements made and claimed by H. S. Palmer, in patents Nos. 375, 377, Dec. 27, 1887, 623, 686, April 25, 1899, 727, 427, May 5, 1903 and 727, 428, May 5, 1903.

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CEMENT
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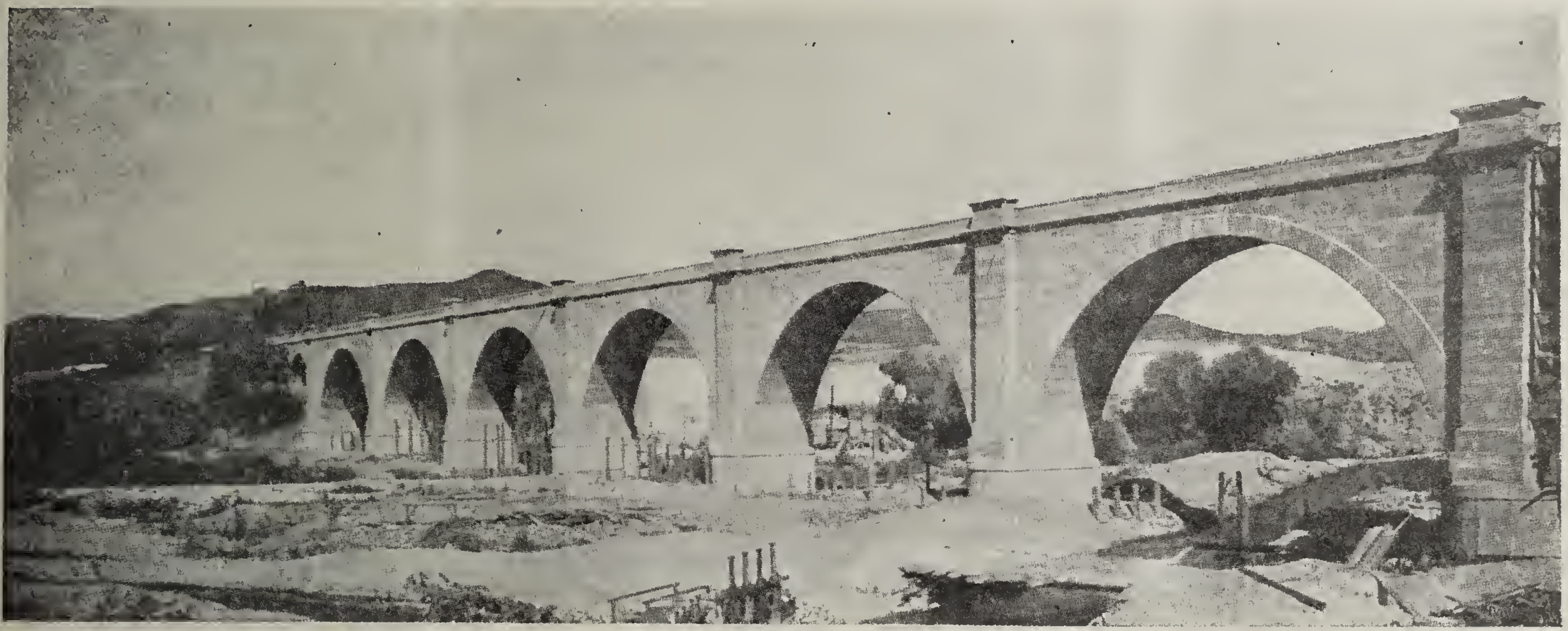

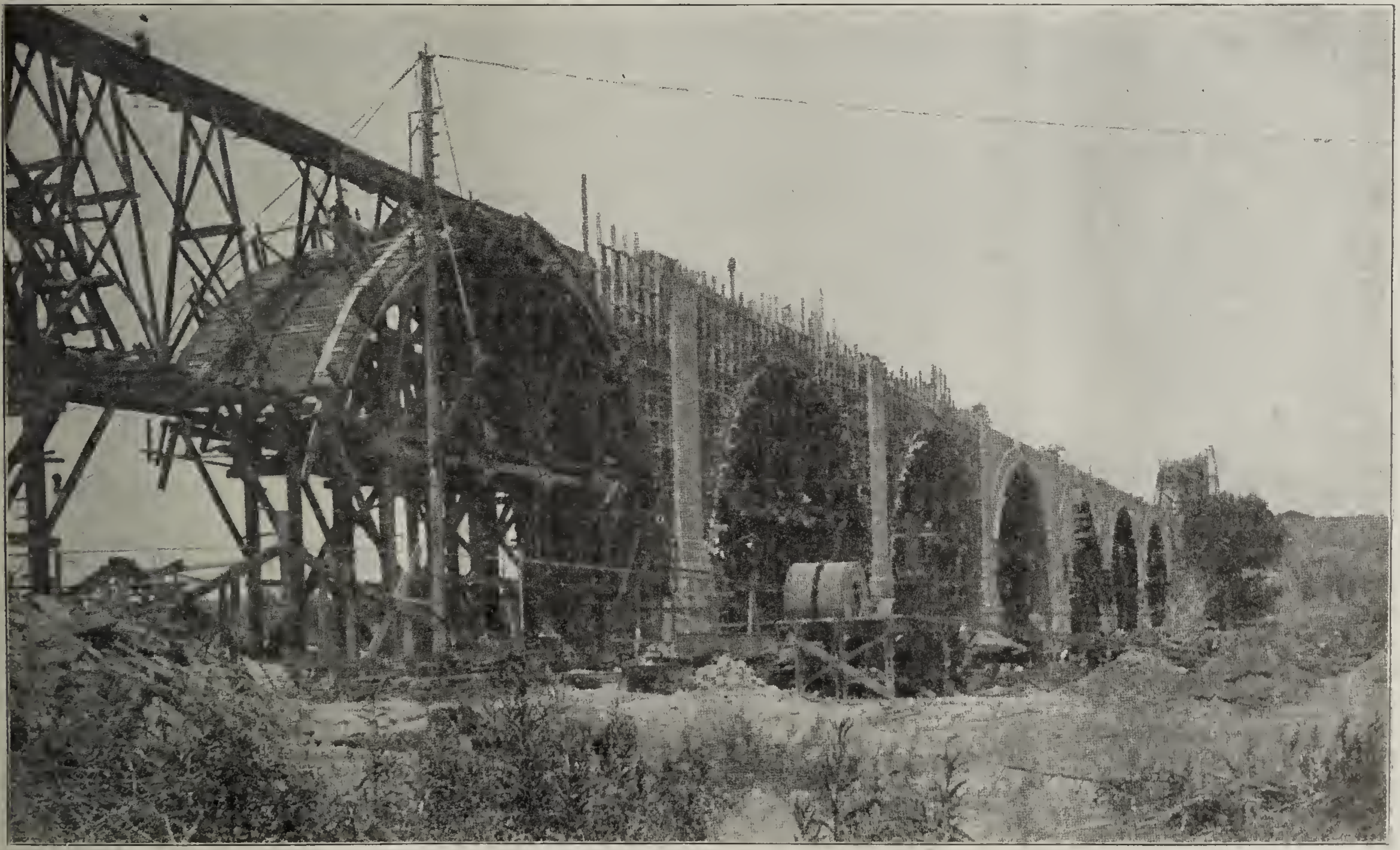

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FOR THE SAN PEDRO, LOS ANGELES AND SALT LAKE RAILWAY.

Under Construction, 984 Feet Long, 70 Feet High, 17 Feet Wide. Cost $200,000.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
OFFICE—226 La Salle Street.
Cable Address—"Seafert," Chicago.

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and transmitted through the mail
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"This world belongs to the energetic"

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, MAY, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

STANDARD SPECIFICATIONS FOR CEMENT BLOCKS.

One of the most important subjects to be considered by the cement block industry is Standard specifications for cement building blocks that will meet the approval of municipal corporations, engineers, architects and the private consumer. Such specifications will inspire confidence and result in the real advancement of the industry. A block with a mixture of 1 cement to 4 sand and gravel will meet all of the requirements for strictly first-class material. It will be dense, fairly waterproof and sound in every way, provided the curing is properly done. While a weaker mixture, say 1 to 7, will be amply strong where the aggregates are properly graded, there is yet an element of danger in new and inexperienced men. The richer the mixture in cement the sooner will the block be ready to set in the wall.

Blocks in which cement has been skimped has now and then resulted in giving the industry a black eye. It is this identical bad work that has made the insurance companies timid in giving reasonable rates.

Bad news travels fast. So does bad work. In every community there are men who are ever ready to pick flaws in concrete construction, especially where the cement block is displacing wood, stone and brick. The cement block is therefore on trial and will be compared with other forms and materials of construction. It behooves the cement block manufacturer not to skimp his materials, but always to turn out strictly high-grade work, and he will be the gainer in the end.

Cement & Engineering News has removed to 226 La Salle Street.

CEMENT BUILDING BLOCK MACHINE MANUFACTURERS' MEETING.

A meeting has been called for the purpose of forming an association of the manufacturers of cement building block machinery, to be held at the Great Northern Hotel, Chicago, Ill., June 27 and 28. The call is made by S. L. Wiltse, temporary chairman. It is to be hoped that a full attendance will be present as matters of great importance will be considered.

The cement block industry now covers a wide field of usefulness and represents millions of invested capital. It is therefore high time that the backbone of the industry, the machine builders, should come together and form a permanent association for the purpose of conserving their joint and several vested interests and to act as a unit to further and promote the industry, and especially to undermine and remove the thin veil of prejudice which clings to the block industry in the minds of a certain class of kickers, who are constantly crying down the innovation the cement block is effecting in the building industry. This is particularly true of a certain class of old line architects, who still cling, with Chinese persistence, to the materials of their fathers, shutting their eyes to the living, breathing present, with its potent array of forces, which are constantly undermining and transforming old ideas and methods established by our ancestors into modern economical methods and processes of manufacture. This is the position of the concrete block, compared with the old line building materials.

HOW TO LAY A TAR AND GRAVEL ROOF.

A well-known roofer recently gave out these specifications for a first-class tar and gravel roof:

The rosin-sized sheathing paper or unsaturated felt to be used shall weigh not less than five pounds per 100 square feet. The felt shall weigh not less than 14 pounds per 100 square feet, single thickness. The pitch shall be the best quality of straight run coal tar pitch, distilled direct from American coal tar, and there shall be used not less than 120 pounds (gross weight) per 100 square feet of completed roof. The nailing shall be done with threepenny barb wire roofing nails driven through tin disks. The slag or gravel shall be of such a grade that no particles shall exceed ⅝ inch or be less than ¼ inch in size. It shall be dry and free from dust or dirt. In cold weather it must be heated immediately before using. Not less than 300 pounds of slag or 400 pounds of gravel shall be used per 100 square feet.

The materials shall be used as follows: First lay one thickness of rosin-sized sheathing paper or unsaturated felt, lapping each sheet 1 inch over the preceding one, and nailing only so often as may be necessary to hold in place until covered with the tarred felt, and the nailing may be omitted entirely if practicable. Over the rosin-sized sheathing or unsaturated felt lay two full thicknesses of tarred felt, lapping each sheet 17 inches over the preceding one, and nailing along the exposed edges of the sheets only so often as may be necessary to hold the sheets in place until the remaining felt can be applied. Over the entire surface of the felt thus laid, spread a uniform coating of pitch, mopped on. Then lay three full thicknesses of felt, lapping each sheet 22 inches over the preceding one, and nailing, as laid, every 3 feet, not more than 10 inches from the upper edge. When the felt is thus laid and secured, mop back with pitch the full width of 22 inches under each lap. Then spread over the entire surface of the roof a uniform coating of pitch, into which, while hot, embed slag or gravel.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	MARCH				NINE MONTHS ENDING MARCH			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom.	3,632,080	11,935	....	....	43,906,472	139,635	6,997,424	22,910
Belgium	10,946,800	35,159	14,750,740	50,955	165,016,438	498,204	129,956,338	428,632
France	297,600	1,277	....	....	6,564,540	24,936	5,511,299	21,713
Germany..........	22,870,317	81,909	15,018,043	51,909	296,942,445	1,015,301	168,772,830	572,771
All Other Europe.	....	....	600	5	4,898,892	13,650	1,227,501	4,224
British North Am.	....	....	8,000	286	890.515	4,162	152,915	1,049
Other Countries..	1,700	12	....	....	3,265,148	13,275	1,871,264	7,166
TOTAL	37,748,497	130,292	29,777,383	104,437	521,484,450	1,709,163	314,489,571	1,058,465
Domestic Exports of Cement, bbls.	18,578	27,673	54.262	88,009	218,580	331.599	723,949	1,047,261

There were 14,773,297 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in March, 1904, valued at $46,682, against 11,036,396 lbs. in March, 1905, valued at $35,609.

Imports of asphaltum or bitumen for March, 1904, were 9,553 tons, valued at $33,589; against 9,272 tons in March, 1905, valued at $64,532.

For nine months ending March, 1904, there were 124,708 tons of asphaltum imported, valued at $388,.179.against 89.564 tons, imported in nine months ending March, 1905, valued at $418.465.

THE SECRET OF A GOOD CONCRETE.

A good concrete need not be over rich in cement. A standard mortar mixed 1 of cement to 3 of sand should be the basis of all good concrete, mixed with crushed stone, sand and gravel. First, the voids in the crushed stone should be determined. This is done by taking a measured quantity of a fair average of the crushed stone, place the crushed stone in a watertight vessel, say 1 cubic foot capacity; fill up to the top and smooth off. Now, pour water into the vessel and let it rise to the top. Next, pour off the water into a measure. The volume of water will give the voids in the crushed stone. Next, measure off a quantity of gravel equal to the bulk of water which was poured off of the crushed stone. Mix the sand with the measured quantity of crushed stone and deposit the mass in the same vessel as before. This mixture should all go into the watertight vessel. Again fill the vessel with water, and pour off as before. The water will again give the remaining voids. Measure off a quantity of sand equal in bulk to the water drained off and mix with the crushed stone and gravel. Such a mixture will produce a dense concrete with a minimum of cement. This is the rule to be followed in mixing the aggregates to produce a good dense concrete, as it reduces the voids in the aggregates to a minimum and prevents the wasting of cement which would otherwise have to be used in filling the voids in an improperly proportioned mixture of the aggregates.

Where a gravel concrete is to be used the same method may be employed as given for crushed stone, sand and gravel mixture.

Fine sand alone calls for a greater proportion of cement, since the larger grains of sand and crushed stone displace more area in the mass and consequently only need to be coated on the surface, while the fine sand grains present a much larger surface, counting the combined surface of all the individual grains than an equal volume of the individual gravel grain or piece of crushed stone. As a rule crushed stone concrete will not produce as dense or watertight a product as sand and gravel alone, due to the irregularity of the shape and form of the crushed rock, because of the numerous voids produced, which cannot be completely filled by either the addition of gravel or sand, or both. Therefore, crushed stone should be avoided where a better class of impervious wall or other masonry is required. Another reason why crushed stone does not produce the highest grade of concrete is that in the crushing process minute fractures are produced in the stone, due to the great strain to which it is subjected in passing the crusher, especially where the work is to be subjected to heavy loads or shocks which set up tension stresses in the completed work. Crushed limestone used in concrete does not produce the highest class of work, yet it is very deceptive, as it will show up much better than gravel concrete within twelve months. After twelve months it will fall away in strength. It acts much like an overlimed Portland cement, which develops extraordinary high tensile and compressive strength in a short time. Afterwards it gradually becomes weaker, and after a time disintegrates. While limestone concrete does not produce the bad effects of an overlimed cement in disintegrating, still it does not retain the good properties developed in the earlier stages.

Fine powdered clay, up to 6 per cent, is a valuable addition to concrete. It must be free from loam or vegetable matter. The clay must be absolutely free from lumps. It can be prepared by digging and exposing to frost during the winter, when it will fall to powder finer than any mill can grind it. In this state it will form an excelent filler and add to the strength of the concrete mass. Several of the large railway companies are using sand and gravel carrying up to 12 per cent clay. The laboratory tests made by these companies show that the clay filler produces better concrete than where the sand has been washed free from clay.

The time is coming when the addition of a certain proportion of clay will be specified for good concrete work.

CONCRETE IN THE MINING INDUSTRY.

Concrete is now displacing wood in the mining industry. It is found to be more durable, efficient and in the long run more economical than timber and lumber. Concrete is used for lining shafts, airways and other openings, from top to bottom of the various openings. It does away with the water dripping down the sides of the shafts, so common with wood linings, which rapidly deteriorate and must frequently be replaced, while concrete once in place calls for little or no repairs. At the same time it holds the loose rock and earth in place, thus removing the element of danger, which is always more or less present in the wooden linings, especially in deep mining, where death often results from caving in of the sides of the shaft. Great tracts of forest lands are denuded to supply timber required in mining operations, and in numerous instances the timber supply having run short, in the immediate vicinity of the mines, long hauls at great expense were entailed to keep up the necessary allotment, to permit work to be continued with safety. Concrete displacing wood in mining has brought the desired relief in this respect. Its use is destined to become almost universal in permanent mining operations.

CEMENT MANUFACTURERS' MEETING.

The Central Cement Manufacturers' Association held a meeting at the Pantling Hotel, Grand Rapids, Mich., May 22, twenty manufacturers being in attendance. The marketing of cement through dealers, instead of selling direct to consumers was discussed.

Secretary Meyers gave out the following in relation to this subject:

"As far as it is possible the manufacturers desired to transact their business through the dealers, but in the case of many municipalities, state and national governments, big contractors and the corporations which used the products in large quantities, the only equitable course to pursue seemed to place them upon the plane of dealers rather than upon that of consumers. In fact, such users of the product as were here listed handled so much cement in any one undertaking that it practically was impossible for the regular dealer to care for the business at a price which would be profitable to themselves and the user."

The reports from those present were to the effect that business was so great with all that they did not care for any more at present prices. It was asserted that a number of the manufacturers had been obliged to call their men in from the road and that others were contemplating taking the same course.

A strike at the American Cement Company's mill at Egypt, Pa., by 40 Slavonian laborers who were displaced by other and more desirable help. The Slavonians who had been displaced attacked the new hands by hurling stones into the windows. At the noon hour the new men were assaulted. Numerous injuries resulted. The following day most of the strikers were re-employed.

The stockholders of the American Cement Co. have been given the first option on the securities of the new cement company to be known as the Reliance Portland Cement Co., whose output is to be in the hands of the American Cement Co. The securities of the Reliance company will consist of $600,000 first mortgage, 30-year, 6 per cent bonds, $300,000 7 per cent preferred stock, and $500,000 common stock. A sinking fund of $15,000 annually will be provided for the redemption of the bonds and interest and dividends on the preferred stock and will be guaranteed by the American Cement Co.

REGENERATIVE ROTARY KILN.

Mr. P. O. Krottnaurer, of Chicago, Ill., has been allowed all claims on a Rotary Portland Cement Kiln, in which powdered coal or producer gas fuel can be used in combination with a rotating air regenerator. This kiln and regenerator being self-contained, and permits the firing with the least possible excess of air for economical combustion, discharging cold clinkers. The apparatus can be attached to any existing kiln at a slight expense compared to the resulting economy, and particularly so for producer gas, which permits the use of inferior grades of coal and dispensing with the drying and grinding of same. With the regenerator system producer gas is likely to become the economical fuel for the rotary in Portland cement burning, being readily adjustable without changing the analysis called for by the properly compounded raw mix, as the varying proportions of ash in coal do not become incorporated with the clinker.

Under this system practically all of the clinker heat is utilized to produce perfect combustion for either powdered coal or producer gas. It is a well established fact that producer gas can only be economically used in connection with the regenerative system.

The regenerative process has been in successful use in the glass industry for the past forty years, and for nearly the same period in the prouction of steel, on account of the greater economy and purity of the product obtained.

The Indians of the Choctaw tribe in the Indian Territory have a good roads association.

Portland cement concrete constructions for farmers' use is now a regular topic for discussion at Farmers' Institutes, in state and county meetings. The farm papers are likewise pushing cement construction. There is scarcely an issue that does not contain articles on this subject. We clip the following from the National Stockman and Farmer: "As much as cement is recognized by the farmer, it has not begun to take the place of importance it really deserves on the farm. Nearly every farmer has almost unlimited capital in his supplies of sand and gravel which could be utilized in building permanent walls, making cement posts, watering troughs, gutters, reservoirs, floors, walks, etc., etc., not to mention its importance in the construction of farm buildings and residences. In the use of cement the farmer becomes, in the truest sense, a capitalist. He is his own employer, and his hired help can be turned to this work whenever lack of other work affords opportunity. Spring is the best time to begin cement work, because then the air is moist and assists cement work in setting and becoming properly cured."

FINANCING BUILDING OPERATIONS IN NEW YORK CITY.

By Charles W. Russell, Arch.

Most of the dwellings of the large cities of the world have been built by operators building rows of similar houses and selling them separately. This form of operation appeals to a large number. Men of small capital can start in a small way, and by investing their profits in more houses often build whole neighborhoods. They are usually successful during rising markets. Of course, houses reproduced a number of times can be built more cheaply than separate houses.

The plan of finance is often to employ an "architect" to make the plans of one house. A loan is then procured, and the different sub-contractors are induced to wait for their final payments until some of the houses are sold.

But there are many builders who have built very good houses to sell, in New York, and a large number of fireproof residences have been built and sold, and not a few have brought between one hundred thousand and two hundred thousand dollars each in the last few years. There are now very few private residences on Manhattan Island, apartment erected houses being the rule.

In the financing of a building operation, the promoter has usually to provide the difference between the amount of money that can be borrowed on the enterprise and the cost of it. The permanent loan is usually made by a financial institution on a conservative basis, loaning only 50 or 60 per cent of the value of the enterprise at a low rate of interest. If the conservative institutions decide for certain reasons not to loan money, there is very little promoting done until they wish to again loan. Of course, there is a great deal of money loaned by private individuals, but their loans are generally of smaller amounts.

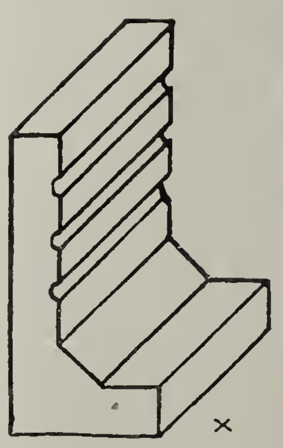
There are institutions which make a business of loaning and selling the mortgages to private individuals. Thus, the financial institutions have the first claim on most enterprises. They decide whether there will be an active business or not. If they are desirous of loaning, there are always operators who are anxious to promote enterprises.

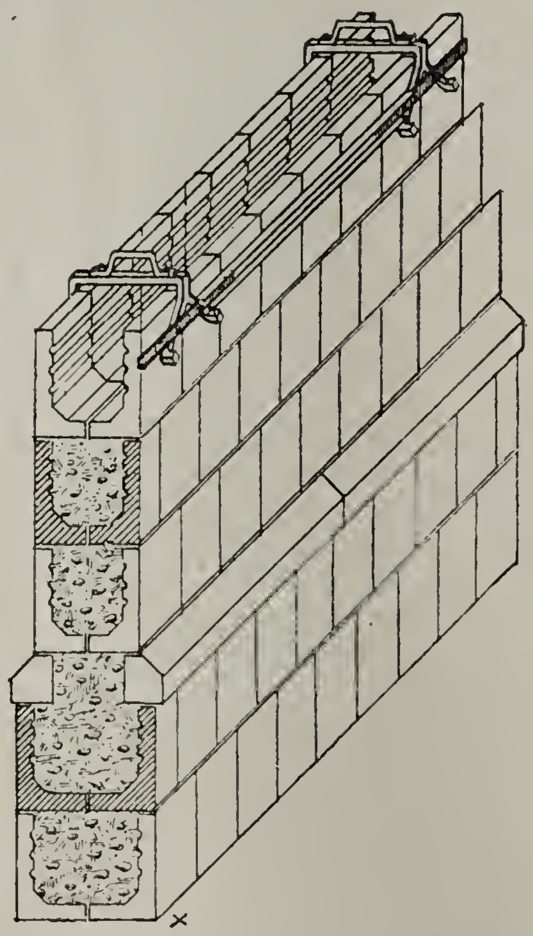
As the size of operations in this country has increased to enormous proportions, so have construction companies, promoting companies, and realty companies been formed with very large capital. Some of these have increased their scope until now they will underwrite the mortgage and assist in financing the whole operation and build the building. This class of operation is almost exclusively confined to central and staple property.

A popular mode of procedure for men who wish to operate in real estate is to form a company, usually called a realty company, and for each particular building operation a subsidiary company is formed by the parent company, which method, under the laws of the state of New York, eliminates the element of personal liability of the stockholders.

CONCRETE BUILDING BLOCK.

F. Gramp of Nerchau, Germany, has invented a concrete building block which we illustrate. Fig. 1 is the block. Fig. 2 shows a section of wall constructed with the block. It will be seen that the block forms the outside and inside face of the wall. The space between the two blocks being filled in with concrete, the blocks being held in place by clamps connected by bars during the filling in process. The ribs on the inside of the block are designed to give a better bond between the block and the concrete filling, which insures a solid wall construction.





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*From a paper read at the recent convention of the American Institute of Architects, Washington, D. C.

RUSSO-JAPANESE WAR SCENES.

Our readers will be interested in the illustrations of the Russo-Japanese war we present scenes taken on the field of battle in Manchuria and incidents attending the same. The editor was presented with 53 views taken by the Photographic Department of the Imperial Japanese Headquarters and copyright by the Military Survey Department, of which nine views are herewith reproduced and published by K. Ogawa, Tokio, Japan. It will be noted that the exact time and place of the scene are often given showing the extreme accuracy and thoughtfulness of Japanese methods.

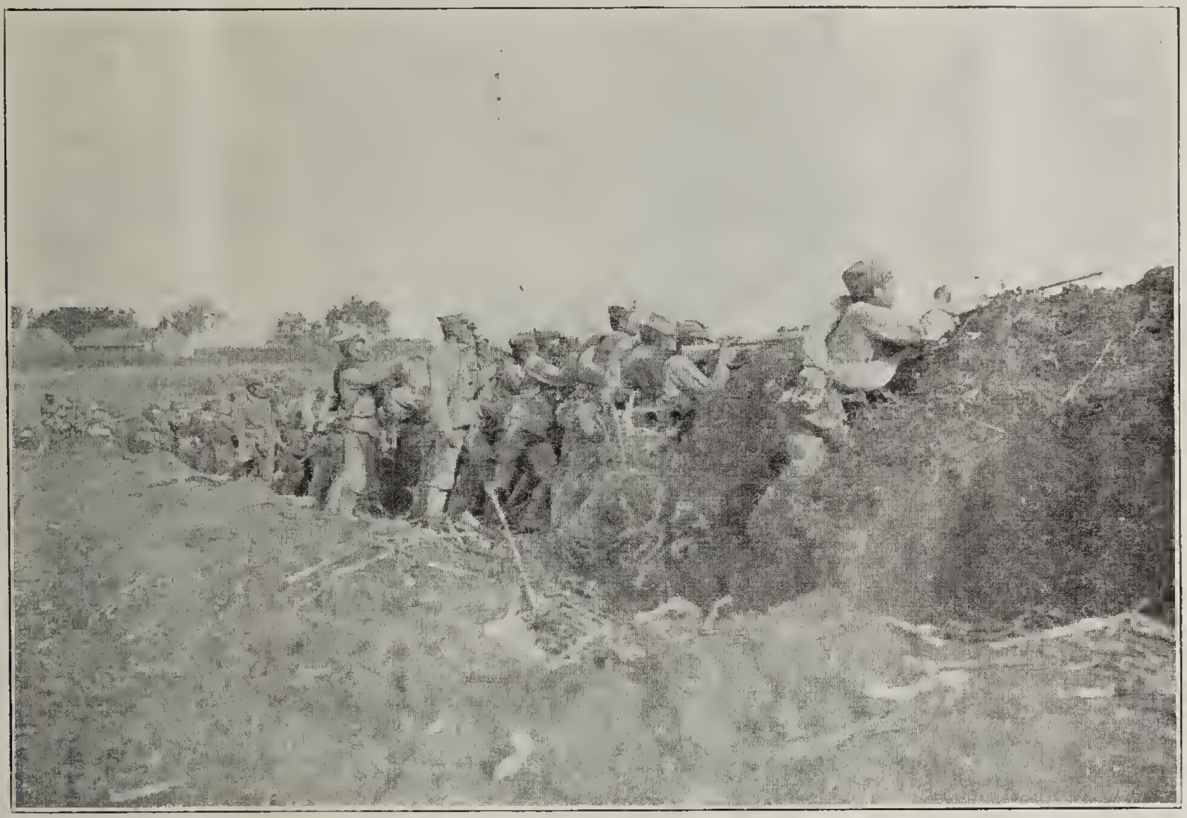


Fig. 1. Firing from Trenches, West of Liao yang, Sept. 3d. 8:17 a. m., 1904.

THE ALUMINUM INDUSTRY.

The combined output of aluminum in Germany, Austria and Switzerland in 1900 was 5,250,000 pounds, which has been maintained each year since.

France produces about 3,300,000 pounds annually.

The United States in 1903 produced 7,140,000 pounds.

The range of prices for this metal was as follows: 1855, $128 per pound; 1856, $64.80; 1857, $25.92; 1886, $13.20; 1888, $6.22; 1890, $3.56; 1903, 54c to 60c per pound. Aluminum is selling in this country: No. 1 ingots, 33c to 37c per pound; No. 2 ingots, 31c to 34c per pound; rolled sheets, 4c per square foot and upward, depending upon the gauge of the sheets.

The commercial travelers tax in Brazil is now being rigidly enforced in the state of Pernambuco, $108 is exacted, besides a surtax of 15 per cent, bringing the entire tax up to $120. The exact contents and value of all trunks and packages must be declared to avoid penalties.

Editor Cement and Engineering News:

Your editorial on concrete brick certainly points the way to relief from discrimination against concrete in units, and the plan you suggest will insure the extensive use of this most valuable building material everywhere in increasing quantities. This growth will be of highest value and a relief to manufacturers of cement. It means a steady all-year-'round and increasing demand for Portland cement for use in manufacture of a product as staple as flour, wheat or iron, that will sell on sight because no one can impeach concrete, or pieces of ordinary concrete.

The fact that ordinary concrete bricks can be now produced for about $2.40 per thousand, while common clay bricks cost about $5.00 to manufacture, makes their general use throughout the country assured.

But these bricks, to be accepted by architects, engineers and builders, must be made wet, sloppy wet, like ordinary concrete; and they must not be porous like the dry process cement blocks produced on the various hand machines; else the objection so frequently made the basis of opposition to use of blocks will be used against concrete bricks. Clay brick machinery has proven impracticable for concrete brick making and the product of such machines is invariably very porous and brittle.

However, machinery is now available that will handle ordinary wet concrete and form it into bricks and blocks, making the bricks practically impervious to water. A plant in Wilmington, Delaware, was equipped with such machinery, and one is under construction in Ohio, and other places are organizing for the purpose.

There are over 5,000 clay brick plants in the United States, and should be room for at least 1,000 concrete brick plants, in view of the bricks costing less , and, as not being burned, they do not warp, shrink, discolor or crack. That number of plants operating summer and winter would help make the cement industry more stable.

The real fight on cement blocks, aside from their being porous, is likely due to the labor union fear that they will reduce the demand for the bricklayer, because as they are in larger and regular units common labor can often lay them. This gives strong political backing to the opposition to cement blocks in most cities.

But labor unions, of course, have no objection to concrete bricks, for a bricklayer will as soon lay 1,000 concrete bricks as 1,000 clay bricks. Concrete bricks, being all of one size and shape, he does it easier and quicker, with no sorting. Whatever we may think of this attitude of labor, it must be reckoned with. Then the building ordinances simply specify "brick," enabling use of concrete brick without a fight for a new ordinance; which is not the case with cement blocks. This is also true with architects' and engineers' specifications. The friends of concrete will do best in its development and introduction by "moving along the line of least resistance."

Very truly yours,
Alfred O. Crozier.
Wilmington, Del., May 14, 1905.

The Western Cement Block Building Company of Logan, Cache county, Utah. Capital, $10,000. Incorporators: Henry T. Cornwall, president; Robert Murdock, vice-president, and G. F. Thatcher, secretary and treasurer.

Fig. 2. Abandoned trenches, after a battle.

NEWS ITEM.

Dodge & Day, engineers and architects, Philadelphia, Pa., have been commissioned by the Electro-Dynamic Company to make a thorough examination of the existing methods in their shops at Bayonne, N. J., and submit report thereon as a basis for changes and improvements contemplated by the management. Business of the Dynamic company has increased to such an extent that it has become an urgent necessity of speeding up the shop, or else providing some adequate facilities, or both. Some years ago the Link Belt Engineering Company were running their shops night and day, yet were unable to keep up with their orders. Extensive additions were contemplated to their buildings, but before carrying out their idea they called in Dodge & Day. As a result, twenty-five per cent greater business is being done to-day on the same floor area, and night work entirely suspended. Improved methods throughout and the introduction of the Taylor system are entirely responsible for this. The Electro-Dynamic Company hope to accomplish the same results.

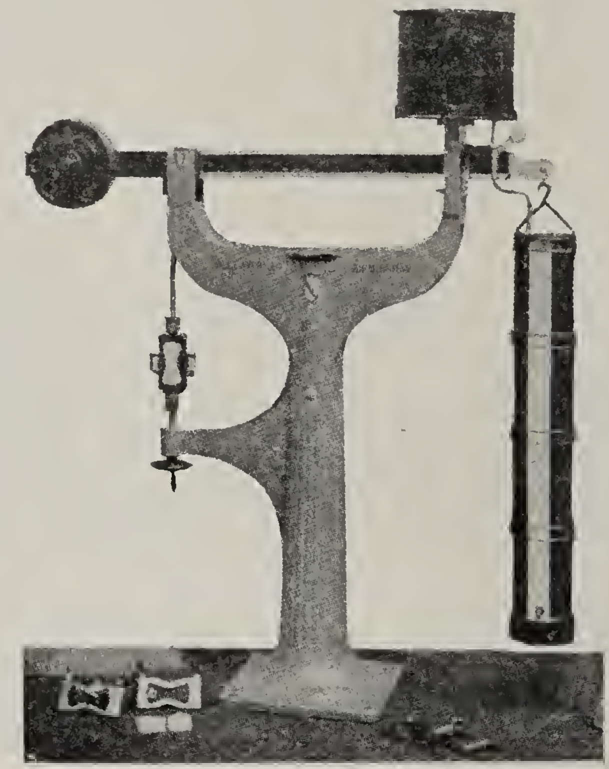
MIRACLE PRESSED STONE CO. BLOCKS.

We are in receipt of five copies of five different letters written by parties who occupy dwellings built of the Miracle double air spaced concrete building block in which the interior plastering is laid directly on the inner face of the block. Neither frost or moisture has penetrated through the wall; that the houses are warmer in winter and cooler in summer than brick or stone walls upon which furring has been used, all due to the double air space. This is certainly a satisfactory showing, as these buildings were erected in North Dakota, South Dakota, Michigan, Indiana and Iowa, and therefore subject to a wide range of temperature.

The Stockton Cement Company of Stockton, Rooks Co., Kan., is making fence posts of cement. The posts have three strands of barbed wire embedded. They are sold for 20 cents, making them as cheap as cedar posts.

CEMENT-TESTING MACHINE.

W. and T. Avery, Ltd., of Birmingham, England, have placed a new cement briquette testing machine on the market, which consists of a base terminating in a hollow column with "U" shaped arms, a graduated steel-yard arm, a hard steel knife edge fulcrum, a cylinder for holding water with a glass gage graduated in pounds to indicate the point at which the briquette is ruptured, a tank for holding water which flows into the cylinder to produce the tension strain on the briquette. When the rupture takes place the water is automatically cut off, and the exact breaking stress is read off at once from the water level shown on the glass gauge. The capacity of the machine is 2,000 pounds.



An English Briquette-Testing Machine.

OPPORTUNITY.

Master of human destinies am I!
Fame, love and fortune on my footsteps wait.
Cities and fields I walk; I penetrate
Deserts and seas remote, and passing by
Hovel and mart and palace, soon or late
I knock unbidden once at every gate!
If sleeping, wake; if feasting, rise before
I turn away. It is the hour of fate,
And they who follow me, reach every state
Mortals desire, and conquer every foe
Save death; but those who doubt or hesitate
Condemned to failure, penury and woe
Seek me in vain and uselessly implore,
I answer not, and I return no more.
—Jno. J. Ingalls.

A cement fence post factory has been established at Stanwood, Iowa.

HOLLOW CONCRETE AND MACHINERY PATENTS.

It is a well-established fact that the H. S. Palmert hollow concrete building blocks and machinery for their production was on the market from 10 to 12 years before any other device or machine made its appearance for producing hollow concrete building blocks. That up to the present time no improvement or progress has been made that is not covered by our patents of 1899, which embodied the fruits of 12 years practical experience, time and money to bring the hollow concrete building block to such a state of perfection as to merit its adoption by architects and others for building purposes. We pioneered the industry through its darkest days, encountering trouble and prejudice on every side, and finally placed it on solid foundations. As soon as this had been accomplished there arose a swarm of emulators to deprive us of our hard-earned rights and prestige, ignoring our valid patent rights, compelling us to appeal to the United States courts for protection against would-be infringers, who during the pending of this litigation are trying to mislead, mystify and confound the public, by doubtful statements, simply to impair confidence and divert attention from our broad foundation patent on the hollow concrete blocks and machinery for producing them. Yet, through the entire controversy one thing stands out clear and undisputed —no one has seriously questioned the great priority of our patents, antedating all others for either the blocks or the machines for producing them.

We are not infringers. No one ever claimed that we were. Here we are absolutely safe. We have, however, been compelled to commence suits against would-be infringers of our patents and will exact royalty from all persons making or using block or machines infringing our patents. H. S. PALMER CO.,
Washington, D. C.

The Alpena Portland Cement Co. has 176 persons on the pay roll. At present the output is over 1,000 barrels every 24 hours.

Fig. 3. Wounded Japanese of the 21st Infantry Regt.

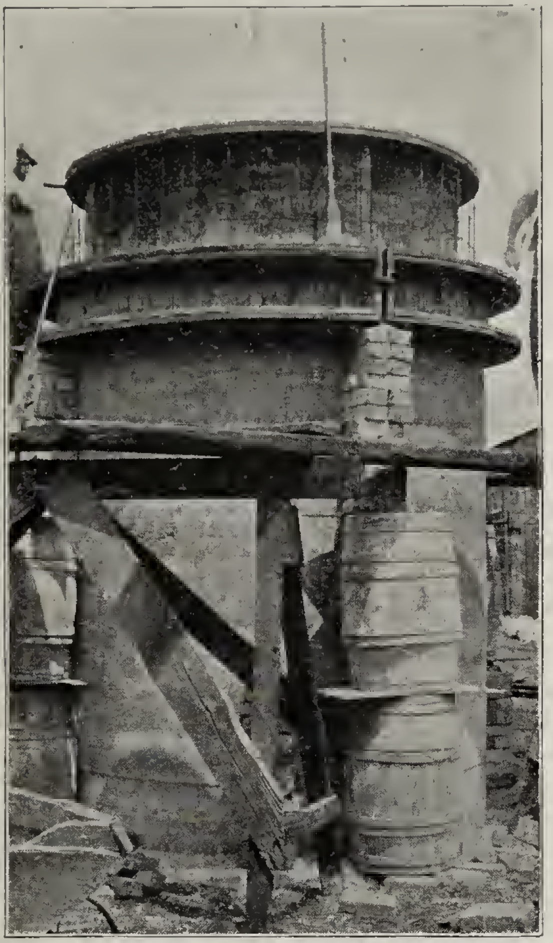
CONCRETE SILOS.

Farmers are beginning to use Portland cement concrete for silos, in which root crops and green fodder is stored for winter use, even green grass may be kept in these silos. Heretofore silos have been constructed of wood, brick or stone, all of which concrete is fast superseding. For small silos plain monolithic structures are built, for larger silos a simple form of reinforced concrete is coming into use, usually expanded metal or plain iron telegraph wire is the reinforcing member.

A silo ten feet in diameter by fifteen feet high should have the foundations carried down below the frost line, the footing being about two feet wide at the base, contracting to sixteen inches at the top of the wall, upon which a wall ten inches thick will answer. Reinforced with sheets of expanded metal placed about one inch from the outer face of the wall and reinforced by heavy wire wound around the expanded metal and spaced two inches from centers for the first five feet of the structure for a circular tank or silo, a core is erected against which the concrete is deposited, a ring or circular form capable of being raised from time to time as the concrete is tamped in place, is shown in the illustration which is an experimental tank constructed for the Cement Department of the Illinois Steel Co., at Chicago, the outer circular form as well as the inner core is clearly shown and the method of supporting the outer form by barrels and loose brick piers each time it is raised. This form is in two pieces capable of being brought close together in order to diminish the thickness of the wall which being ten inches at the base may be contracted to five inches at the top. The expanded metal sheets should lap five to six inches at the ends.

The heavier the reinforcement the thinner may the walls be constructed. In finishing the last ten inches of wall ⅜-inch iron bolts ten inches long should be imbedded in the top, projecting four inches out of the concrete, to be used for anchoring the roof, which is usually of wood. The mixture for the concrete may be one cement, three sand, and four gravel. Where hand mixing is the process, deposite the sand and gravel over which spread the cement and turn not less than three times dry, then add water, just sufficient that when thoropghly mixed the concrete will ball in the hand, deposit in place and ram or tamp well. In finishing the last ten inches of the wall at the top eight or ten turns of wire should be laid or wound around the expanded metal for additional strength. A Silo fifteen feet high with an internal diameter will have a capacity of about 1,179 cubic feet.

Doors or openings are sometimes left in the silo walls for convenience of filling or removing the contents. For this purpose frames should be inserted, as is done in ordinary brick building construction and the doors hung after the structure is finished. Concrete silos when properly built are practically indestructible.


Cement Tank or Silo.

CEMENT BLOCK INSURANCE.

Mr. E. T. Cairns of Chicago has been appointed chairman of a committee of The Underwriters Association of the U. S., whose duty it will be to collect data on concrete building block construction in order to make a proper rating for the same.

Mr. W. G. Sanderson, inspector stock insurance companies, 240 La-Salle street, Chicago, is likewise a member of this committee, and has given the subject greater attention than any other member of the committee. We learn from Mr. Sanderson that underwriters do not discriminate against concrete in any form. On the contrary, they regard concrete constructions as first class risks, knowing this material possesses the highest fire resisting properities. The only drawback is the fear the use of poor materials leave in cement. Let the concrete block manufacturers convince the insurance people that only a sound, reliable block is being manufactured, and the entire trouble will have been swept away. This is just what reliable concrete block manufacturers want, because the foundation of the business depends upon producing a good, sound, substantial product. When this fact is established there will be no farther trouble on concrete building block insurance. The insurance people are therefore working hand in hand with the block manufacturers. The eastern insurance people move slow in these matters, simply because they are at sea on the facts appertaining to the subject of concrete. As they are very conservative on unfamiliar risks nothing can be expected from the National Association of Underwriters for at least a year, as they will await the finding of these experts, while the western insurance men are in closer touch with the real facts relating to the subject, and therefore more progressive.

Geo. P. Saffen and Geo. H. Hindelary of Chelsea, Mich., will establish a concrete building block factory at Walkerville, Ontario.

Fig. 4. Loop hole defenses.

Fig. 5. Cannonading by the 4th Foot Artillery, 5:50 p. m., August 31, 1904.

A NEW AND CHEAP DIET FOR WORK HORSES.

Black Strap, a cheap dark molasses, is now being extensively substituted for a portion of the usual oats and corn ration for horses, with marked advantage both in promoting health and giving greater endurance, at the same time reducing the cost of feeding from 10 to 50 per cent. The molasses is combined with other feed in various proportions. The molasses must be mixed only with finely divided cereal, oats, corn or chopped corn stalks. Bogasse (sugar cane from which the juice has been extracted), course or whole grain fed with molasses passes through the animal without being digested. About nine pounds of molasses per day given in two portions, the noon meal being oats or corn without molasses. In Brooklyn, N. Y., a sugar refinery feeding molasses to its teams gives each horse 1½ quarts cornmeal, 1 quart wheat bran and 3 pints sugar house syrup and 7 pounds cut hay. At noon, 5 quarts oats. The night ration is the same as the morning, except 5 pounds of loose hay is fed in addition to the cut hay which is mixed with the grain.

These horses weigh from 1,700 to 1,800 pounds, and are fed at a cost of 34 cents per day. They are fine, sleek-looking animals, and attract attention of horsemen generally on account of their extremely well-fed appearance. According to experts the economy due to the molasses feed results in a saving of from 20 to 27 per cent over the old system of maintaining on oats and hay entirely.

A plantation working 177 mules fed with a molasses portion resulted in a yearly saving of $6,000. While another plantation cut down the daily ration from 35 to 40 cents to 19 cents. At the same time the health of the animals was greatly improved, with increased efficiency of the animals all around.

Fig. 6. Wire entanglement defenses—Russian.

The German army issues a sugar ration to its troops on account of its high food value.

The hygienic value of the molasses feed formula is proved by an experiment which was made on two rundown horses that had been kept upon ordinary rations. Their weights were 890 and 925 pounds when they were put on the molasses system, and both soon showed improvement in weight and health. At the end of six weeks the smaller had gained 200 pounds, and the other was 181 pounds heavier.

W. C. Stubs, director of the Louisiana Experimental Station, says cane sugar molasses has been extensively used with success for a number of years in feeding horses and mules in Louisiana, many feeders keeping mules exclusively on a ration of rice bran and molasses in addition to corn pea hay.

A cement post factory is to be erected at Lake City, Calhoun Co., Iowa, by the Electric Concrete Post Co. The building, 44x110 feet, will be constructed of concrete building blocks.

A patent has been granted to Gus Garrett, of Cambridge City, Ind. The invention consists of imbedding lead or other soft metal nailing clips in the face of the post before it hardens, into which nails can be driven for fastening boards or wire staples. Can be used for fastening wire fencing. It is claimed the lead clips will last as long as the cement post.

John DeHaven White has been appointed receiver for The Sand, Lime & Cement Co. of Berwick, Pa. Liabilities, $10,000; with small assets. The company's personal property was sold at sheriff's sale before the receivership.

Fred Seusch of Toledo, Iowa, is manufacturing concrete shingles with machinery invented by himself.

Fig. 7. Funeral services conducted by the 34th Infantry Regiment. After a battle near Kapping.

Fig. 8. Wolf hole pit defenses used by the Japanese as shellers from artillery projectiles, with a single exposed sentry on guard. These pits are at times used after battle for the burial of the dead.

CONCRETE A MONEY SAVER ON THE FARM.

C. A. TINKER.

Portland cement concrete is to be recommended for general use by reason of its durability, sanitary qualities and moderate cost. It has no joints nor seams to afford a lodging for dirt and foster the growth of noxious fungi; it can be swept, washed, scrubbed and scalded, without injury to its texture; it does not decay or splinter, thus doing away with nails and patches. Further, it does not possess the disagreeable quality of absorbing gases and odors. Add to these qualities coolness in summer and warmth in winter, and moderate cost, and we have one of the most logical building materials in present day use. Concrete is not expensive when compared with other materials of construction, such as stone, brick and wood. To be sure, the initial cost of wood is less than that of concrete, but when we consider the life and quality of the finished product, concrete is easily the cheaper.

In the specifications here presented Portland cement is reckoned at a cost of $1.25 to $1.55 per barrel, 1¼ barrels of cement being required for each cubic yard of concrete. Where sand and gravel may be had from the farm or found nearby, it can often be bought at 10 cents a load. Add the cost of the forms and the labor of mixing and laying the concrete, which should be done at an expense not exceeding 75 cents per yard, and we have a total expense ranging from $2 to $2.75 per cubic yard, but under very favorable circumstances the cost may be reduced to less than $2. Only the best brands of cement should be used. The sand should be clean, coarse and sharp, and free from all foreign matter that would in any way tend to weaken the concrete. Broken stone with sand and cement makes an ideal mixture, but is objected to on account of the cost of the broken stone. Gravel may be substituted for the stone, however, with excellent results. The gravel should be washed and cleaned, and if very coarse passed through a screen. The gravel should range from ¼ inch to 2½ inches in diameter, but should not exceed 2½ inches, and to obtain the very best results the major portion should be between the limits of 1 and 1½ inches.

In mixing concrete for general use the following proportions are perhaps the best: One barrel cement to three barrels sand and five barrels gravel. In this mixture the voids or spaces between the stones are entirely filled, and when hardened or set, the concrete virtually becomes a solid monolith.

To secure the best results mix the concrete as follows: Have the gravel washed and in readiness, usually on a platform of planking or boards, to permit easy shoveling and insure against waste. Add enough water to the cement and sand, which have been thoroughly mixed in a mortar bed, to make a thin mortar, not too thin, however, to permit easy shoveling. Spread the mortar on the gravel and thoroughly mix by turning with shovel until the mortar and gravel are well incorporated. Then without delay shovel the batch of concrete into the forms or spread it on the floor as the case may be, being careful not to exceed layers of 8 inches at each filling. Each layer must be tamped and rammed till water flushes to the top.

Proceed in this manner till the forms are filled. In hot summer weather damp cloths or boards should be placed over the top of the concrete to keep it from checking after the final layer has been placed in the forms. The forms must necessarily be water tight, and the concrete worked back from the boards with a spade so the softer material may flow to the outside and insure a smooth surface. If this last is not done voids will surely result and the work will be disappointing. Let the concrete rest four to six days before removing the planking; concrete being somewhat brittle until thoroughly hardened, and while in the "green" state easily broken.

Concrete when first mixed is such a mobile substance that it is readily molded to any desired shape or form, hence its great utility in constructing the varied appurtenances of the modern farm. Consider, for instance, the many uses to which concrete may be

Fig. 9. Russian prisoners and Japanese guards.

put on the average modern farm. The silo, that indispensable food conserver; the vegetable cellar, the rat-proof granary, the icehouse, etc. In the tie-up, the manager may be so constructed that the drinking water is carried past the animals, and the waste passed off by means of a grade in the manger, or through waste pipes set at intervals. The concrete manure gutter may be arranged so the droppings and urine are easily pushed along into the concrete manure pit, insuring the conservation of the last vestige of nitrogen and other available constituents which are so valuable as fertilizing agents.

Fig. 10. Field Marshal Marquis Yamagata, Chief of the General Staff, Japanese Army.

And the dairy room and creamery, let it be of concrete by all means. Then it may be washed and scalded and kept free from dust and dirt and the ever-present germs.

Among the general uses to which concrete may be subjected is the construction of water and fireproof foundations and building walls, pavements, celery cellars, corn cribs, cisterns and wells, stable and tie-up floors, water gutters, chimneys, sugar houses, pigsties and other indispensables of the up-to-date farm.

Granite Concrete Stone Company, Lancaster, Pa. Capital, $25,000.

NEW BUILDING BLOCK FACTORIES.

Arkansas.

Harper & Wilson, Fort Smith.

California.

Harry Woodstock, Whittier.

Colorado.

Dodds Bros., Fort Collins.

Illinois.

John Martin, Arthur.
Grant Hungerford, Mount Carroll.
Carlyle Concrete & Construction Co., Carlyle.
W. B. Bradsby, Greenville.
Messrs. Neher & Son, Shelbyville.
Jansen & Zoeller, Pekin.
Ill. Gravel Co., Princeton.
Johnson & King, Champaign.
Ward & Roach, Harvard.
Captain W. D. Green, Albion.
Stuart & Robinson, Neponset.

Iowa.

H. H. Connell, Deep River.
Kid & Furneaux, Reinbeck.
Anthes Lumber Co., Knoxville.
J. S. Layton & Son, Shenandoah.
Frank Evans, Casey.
Clarion Concrete Co., Eagle Grove.
S. T. Kenny, Hawarden.
Bellamy, Gates & Dawson, Nashua.
C. C. Wetzstein & Co., Early.
Ad. Hauman, Eagle Grove.
Fred Leusch, Toledo.
Aaron Jonker, Eldora.
W. D. Crone, Imogene.
J. S. Johnson, West Union.
Waldo & Wimmer, Maxwell.
A. Burkholder, Clarksville.
J. J. Taylor, Rock Rapids.
John Olsen & C. W. Bradley, Rock Rapids.

Indiana.

Wm. Coon & Son, Frankfort.
Pettyjohn Co., Terre Haute.
Lewis King & Co., Columbus.
Charles Struss, La Porte.
Cedarville Artificial Stone & Cement Co., Ft. Wayne.
M. A. Horner, Brighton.
William Cole, Burlington.
Julius Haugk, Decatur.
John Gusman, Huntington.

Kansas.

Meade Concrete Bldg. Block Co., Meade.
Van Natta & Pratt, Belleville.

Michigan.

Hiram Quick, Manistique.
Frank Miller, Detroit.
Moore & Clay, Big Rapids.
Featham & Gubbins, Alpena.
Stephen Pettit, Hudson.
Frank Robbins, Springport.

Minnesota.

M. C. Madsen, Hutchinson.
Pollick & Riedell, Rochester.
Warren Smith, Faribault.
Geo. V. Clark, Little Falls.
A. J. Reed, Dugdale.

Missouri.

James Neet, Browning.

New York.

E. J. Thompson, Gowanda.

Nebraska.

H. H. Stottko, Geneva.
Joseph Beckwith, Broken Bow.

New Hampshire.

Simon Stahl, Gorham.

North Dakota.

Orvik & Jerdin, Grafton.

Ohio.

Lake Erie Cement & Construction Co., Norwalk.
Kelley Island Lime & Transport Co., Sandusky.
Wolfe & Burdo, Oak Harbor.
George Ryther, Pomeroy.

Pennsylvania.

Faber & Son, Carlisle.

South Dakota.

Fans & Seiler, Pierre.

West Virginia.

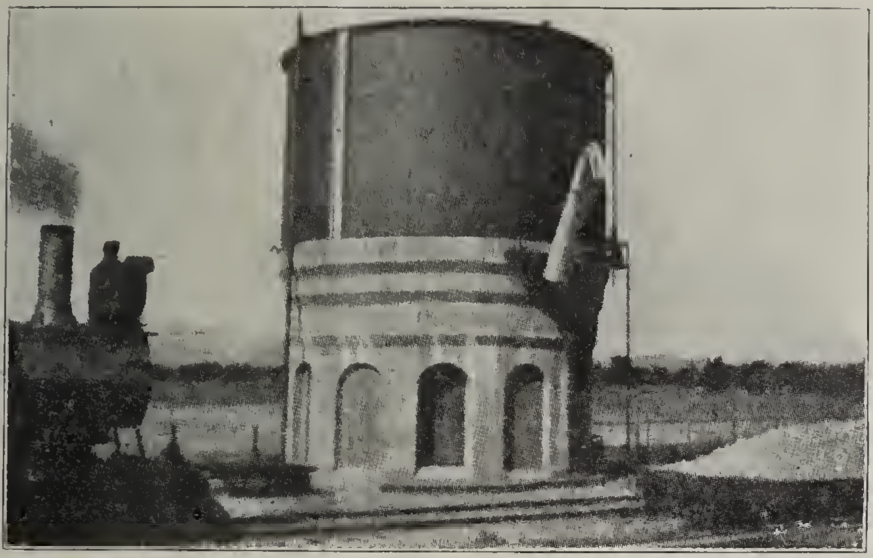
Bridgeport Concrete, Co., Wheeling.

Wisconsin.

Wm. Moss, Westfield.
August F. Gehling & James F. O'Neill, Oconta Falls.
John W. Santers, West Bend.
Jefferson Cement Block Co., Fort Atkinson.
Thos. Darcey, Emmet.

CONCRETE RAILWAY BRIDGE.

The San Pedro, Los Angeles & Salt Lake Railway Co., operating a new line between Salt Lake City, Utah, and San Pedro, California, have made extensive use of concrete on its right of way, in the construction of bridges, viaducts, water tanks and passenger stations. The great eight-span bridge over the Santa Ana river between Riverside and Ontario in California, which we illustrate under construction and completed. The bridge is 984 feet long, 17 feet wide and greatest height 70 feet. The arches have a clear span of 86 feet 19 inches, and a rise of 36 feet 9 inches from spring to crown. The piers are 28 by 16 on nine granite bed rock foundation. The arch at the crown is 42 inches deep. The arch rings were made of California Portland cement, mixed one cement, two sand and 4½ crushed stone. The mix for the spandiel walls was 1 to 11. The centering for the arches was supported on four pile bents in clusters of piles, each with 12 by 12 caps and stringers, 8 by 8 struts carrying the thrust to horizontal cords, supported by wedges on the horizontal stringers.



Standard Railway Water Tank.

The railway company has likewise constructed twelve standard water tanks, shown in our illustration. These tanks stand 37 feet above the track, the lower half being concrete construction, with a steel tank above.

COAL PRODUCTION IN THE U. S. FROM 1814.

The United States Geological Survey has published a table giving the coal production by states based upon the earliest record to date, from which we abstract the following:

The earliest record shows that Pennsylvania mined 22 tons of anthracite in 1814, against 73,156,709 tons of anthracite in 1904. The total anthracite output from 1814 to date was 1,696,963,748 tons.

The bituminous production dates from 1840 in Pennsylvania, when 464,826 tons were mined, against 97,916,733 tons in 1894. The total output from 1840 to date in this state is 1,448,197,679 tons. In 1822 Virginia produced 54,000 tons, against 3,576,092 tons in 1904. Kentucky began mining coal in 1829, producing that year 2,000 tons, against 7,559,940 tons in 1904, total output to date being 93,548,410 tons. Illinois began mining coal in 1833, with an output of 6,000 tons, against 35,990,796 tons in 1904, with a total output to date of 514,152,432 tons. Ohio in 1838 produced 119,952 tons, against 24,415,054 in 1904, total output to date being 407,357,183 tons. Eight states began coal mining in 1840 as follows: Missouri, 9,972 tons, against 4,187,197, with a total of 85,897,673 tons to date; Indiana, 9,682 tons, against 10,929,908 tons in 1904, output to date, 121,554,584 tons; Alabama, 946 tons, against 11,163,194, and a grand total of 125,410,972; Tennessee, 558 tons, against 4,782,302 tons in 1904, and total output of 65,468,484; Iowa, 400 tons, against 6,542,005 tons in 1904, total output, 119,991,709; Arkansas, 220 tons, against 2,009,451 in 1904, total output, 17,287,022; North Carolina, 3 tons, against 7,000 tons in 1904. total output, 475,248 tons. Maryland in 1842, 2,104 tons, against 4,819,171 in 1904; total output to date, 131,511,597. In 1860 Washington produced 5,374 tons, against 3,155,757 in 1904; total output, 33,285,131. Michigan in the same year produced 2,320 tons, against 1,338,447 in 1904; total production, 8,983,143 tons. Georgia, 1860, 1,900 tons, against 393,191 tons in 1904; total, 7,087,197. California in 1861 produced 6,620 tons, against 75,538 tons in 1904 (includes Alaska's output which commenced in 1900); total output, 4,916,764. West Virginia in 1863 produced 446,648, against 32,332,385 in 1904; total to date, 304,950,659. Colorado produced 500 tons in 1864, against 6,594,295 tons in 1904; total, 82,876,393 tons. Wyoming in 1865 produced 800 tons, against 5,177,381 tons in 1904; total, 59,828,585 tons. Kansas, in 1869, 36,891, against 6,322,875; total, 71,394,569. Utah, in 1870, 5,800 tons, against 1,491,607 tons; total, 13,783,232. Indian Territory, in 1880, 120,947 tons, against 3,011,972 tons; total, 30,383,163 tons. Oregon, in 1880, 43,205 tons, against 111,540 tons; total, 1,530,039 tons. Montana, in 1880, 224 tons, in 1904, 1,362,739; total, 19,258,623 tons. New Mexico, 1882, 157,092, against 1,452,183; total, 16,081,685. Texas, in 1884, 125,000 tons, against 1,072,194 tons in 1904; total, 1,810,636 tons.

The grand total production of anthracite and bituminous from 1814 to 1904 was 5,577,210,577 tons. Of this 3,880,246,829 tons were bituminous and 1,696,963,748 anthracite.

From 1871 to 1888 about 38,911,160 tons of coal were produced and classified as colliery consumption and not included in the distribution by states.

Fig. 11. Cannonade of the 2d Battery, 13th Field Artillery, north of Wenchiatun, June 15, 1904, 9 a. m.

SHALLOW CONCRETE CURBING.

The Schatzinger Realty Co. of Cleveland, O., own large tracts of real estate, which is being improved. The curbing is made on the ground where used. Our illustration shows the curbing being placed, by a gang of Italian workmen, who mould and set the curb, as well as place the brick pavement, with which all streets in the tract are being paved. This curbing is set in place for less than 15 cents per running foot, being a great saving over any other class of permanent curbing in the market. About 900 lots will be improved in the company's tract of land as above described.

Setting Concrete Curbing.

INCORPORATIONS.

Cedarville Artificial Stone and Cement Company, of Ft. Wayne, Ind. Capital, $25,000. Directors: A. H. Bettinger, Charles C. Adams, Charles H. Thomas, Elmus R. Gesaman and Amos E. Houk.

Double-Air Space Building Block Co., New York, N. Y. Capital, $100,000. Objects, to manufacture cement blocks and artificial stone. Incorporators: C. W. Blue, 11 Broadway, New York; J. D. Messereau, 354 22d street, New York; J. W. Ripley, 82 Beaver street, New York.

The Ellenville Concrete Stone Company, Kingston, N. Y., has been formed with W. P. Cleveland as manager. Object, to manufacture concrete building blocks from silica rock.

The Oakland Concrete Stone Manufacturing and Construction Co., Lincoln, Neb. Capital, $5,000. Incorporators: Peter Palmer, Theodore Johnson and John Hansen.

St. Louis Cement Roofing and Block Stone Company, St. Louis, Mo. Capital, $15,000. Incorporators: Lena Roos, Everette Henegar, August Roose, Ambrose E. O'Hagen and Martin J. Casey.

The Frederick Concrete Block and Cement Company, Frederick, Md. Capital, $5,000. Object, to manufacture concrete blocks for building purposes. Incorporators: Geo. William Smith, David Wertheimer, William B. James and Elias B. Ramsburg.

The Wisconsin Hollow Concrete Wall Company, Milwaukee, Wis. Capital stock, $100,000. Incorporators: A. H. Spoor, C. L. W. Crosby and W. B. Potter.

Fred. Leusch, Toledo, Iowa. Capital, $25,000. Object, to manufacture cement shingles.

Fig. 15. Gen. Baron Nogi, Commander of the 3d Army Corps.

Bluffs Stone Company, Bluffs, Ill. Capital, $5,000. Object, to manufacture building material and construction. Incorporators: Rufus Funk, James O. Priest and F. C. Funk.

The Livingston Concrete Building & Manufacturing Co., Livingston, Mont. Capital, $10,000. Object, to build sidewalks. Incorporators: E. F. Hamilton, A. L. McLaughlin, Peter M. Doonan, John Doonan and Frank Beley.

Cement Products Company, Hillsboro, Ill. Capital, $2,500. Object, to manufacture cement products, contracting. Incorporators: A. L. Blackburn, J. M. Klar, James P. Brown.

The Christenson Bros., Spencer, Iowa. Capital, $20,000. Objects, to manufacture cement roofing, cement sidewalks and other forms of cement goods. Incorporators: President, O.

Fig. 12. Field Telegraph Corps at work.

Fig. 13. Sapping operations, siege of Port Arthur, against East Kivan Hill forts No. 2.

A. Thomas; vice-president, O. A. Bjornstad; treasurer, Dr. W. G. Crandall; secretary and general manager, F. J. Christenson; assistant manager, J. J. Christenson.

Central Concrete Construction Company, Milwaukee, Wis. Capital, $5,000. Incorporators: A. Bralozik, W. A. Johnson and J. W. Wegner.

The Montreal Cement Company, Ltd., Long Pointe, Canada. Capital, $500,000. The incorporators of the new corporation are Messrs. James Morgan, Thomas M. Morgan, Colin D. Morgan, John W. Cook and Alexander Falconer, all of this city. The new company will manufacture cements.

Plainfield Cement Co., 152 Park avenue, N. J. Capital, $100,000. Object, to manufacture cement, stone, building block, etc. Incorporators: John W. Coddington, Jacob Long, Joshua D. Lorzraux, John H. Kitcheen, William R. Coddington, Olin L. Jenkins, all of Plainfield.

Fig. 14. Siege of Port Arthur, sapping against the East Kiwan Hill forts, No. 1.

Commercial Concrete Block and Building Co., Milwaukee, Wis. Capital, $25,000. Object, to manufacture and deal in concrete building blocks, etc. Incorporators: Daniel E. Smith, F. T. Souther and John Funck.

Streeter Cement Block Company, Keokuk, Iowa. Capital, $10,000. Incorporators: C. D. Streeter, and others.

Fig. 16. Constructing a bridge over the Kaiping River, by the 6th Engineers Battalion, 6th Division, Japanese Army.

Kansas City Portland Cement Co., Independence, Mo. Capital, $350,000. Object, to manufacture Portland cement. Directors: R. R. Miner, president; W. H. Caffery; vice-president and general manager; F. C. Vincent, secretary-treasurer, and J. W. Williamson, general superintendent, all of Kansas City, Mo.

Blanc Stainless Cement Co., Jersey City, N. J. Capital, $75,000. Directors: Horace S. Gould, Otho S. Lee Jr., Kenneth K. McLaren.

Central Concrete Construction Company, Milwaukee, Wis. Capital, $5,000. Incorporators: A. Bralozik, W. A. Johnson and J. W. Wegner.

The Reinforced Concrete Company, Cleveland, Ohio. Capital, $20,000. Incorporators: W. S. Fitzgerald, H. B. Fuller, A. F. Goughan, S. J. Deutsch and E. H. James.

The North Star Concrete Co., Lake Crystal, Minn. Object, to manufacture in the concrete line from the regulation size brick to large building stone, well curbing and fence posts. Directors: D. W. Radichel, J. J. McGuire, Hugh Edwards, S. J. Cookson, W. A. Dredge and Charles A. McGuire.

Temple Cement Stone Company, Reading, Pa. Capital, $10,000.

Buser Concrete Construction Company, Mount Morris, Ill. Capital, $25,000. Object, to manufacture building materials. Incorporators: N. E. Buser, R. E. Buser and J. W. Wine.

The Clifford Stone & Cement Co., Griffin, Md. Capital, $25,000. Object, to manufacture concrete building blocks, paving tile, etc. Incorporators: J. M. Stephens, president; J. Merrihew, vice-president; G. H. Aubrey, secretary, and W. P. Laramore, treasurer and general manager.

New York Concrete Construction Co., New York. Capital, $5,000. Object, to build structures of all kinds. Incorporators: Allen P. Kirk, 352 W. 23d street, New York; J. E. Willert, Passaic, N. J.; Thomas H. Ray, 555 W. 182d street, New York.

The Hornell Concrete Company, of Hornellsville, N. Y. Capital, $7,000. The directors are: Charles Humphrey, Flora P. Karr, Almond; R. O. Humphrey, Hornellsville.

The Caledonia Cement Rock Co., of Caledonia, N. Y. Capital, $10,000. Object, to manufacture cement blocks, bricks and posts.

Double-Air Space Building Block Co., New York. Capital, $100,000. Object, to manufacture cement blocks and artificial stone. Incorporators: C. W. Blue, 11 Broadway, New York; J. D. Messereau, 354 22d street, New York; J. W. Ripley, 82 Beaver street, New York.

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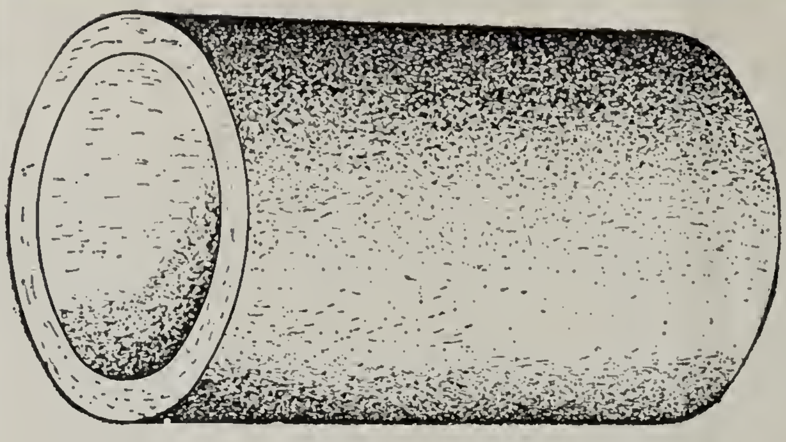

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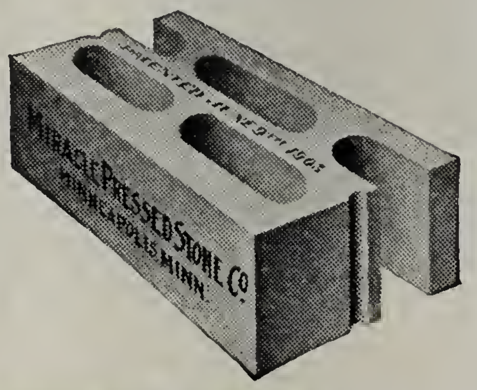

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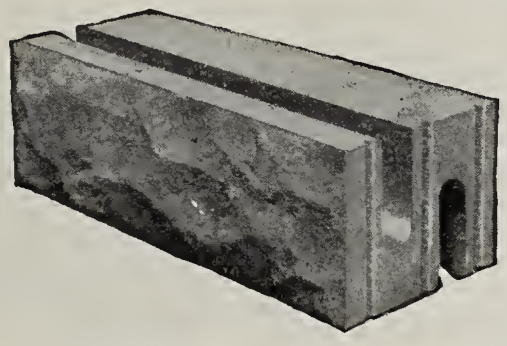

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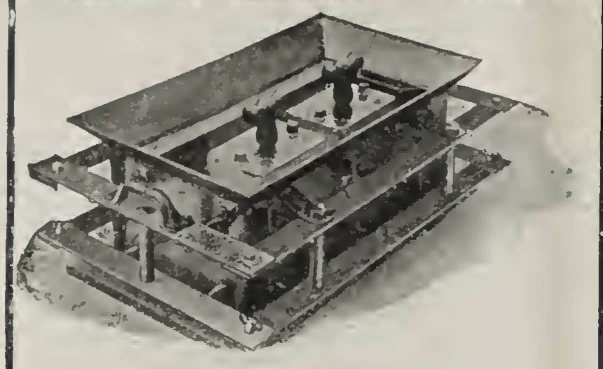

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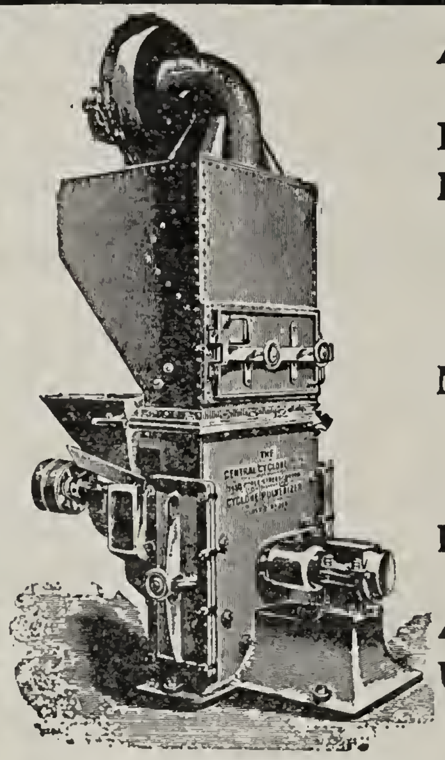

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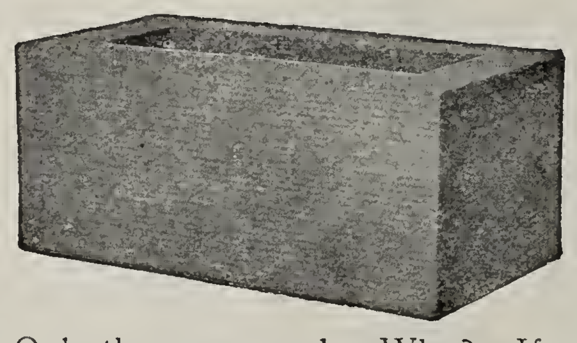

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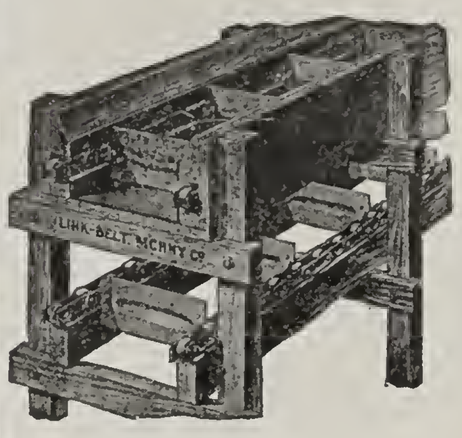

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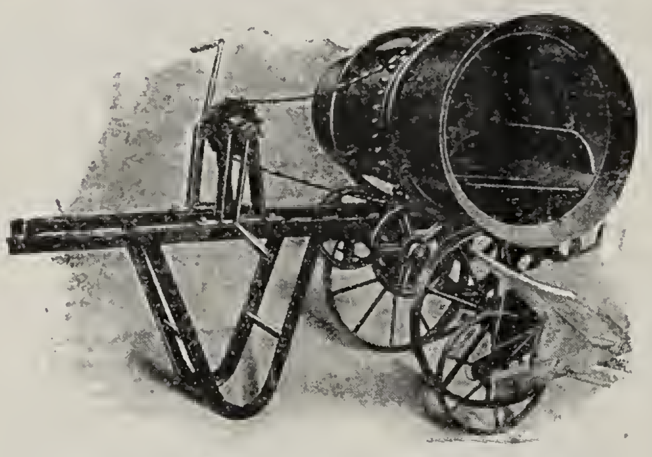

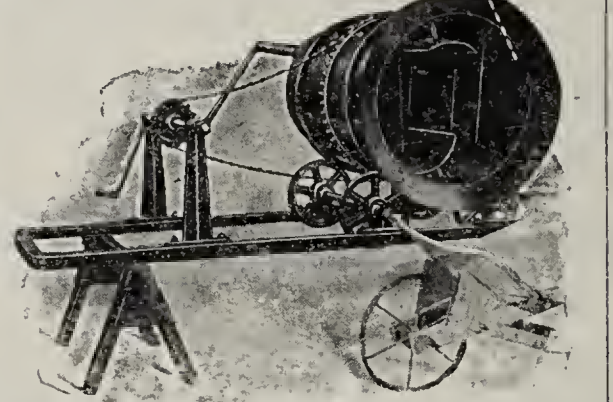

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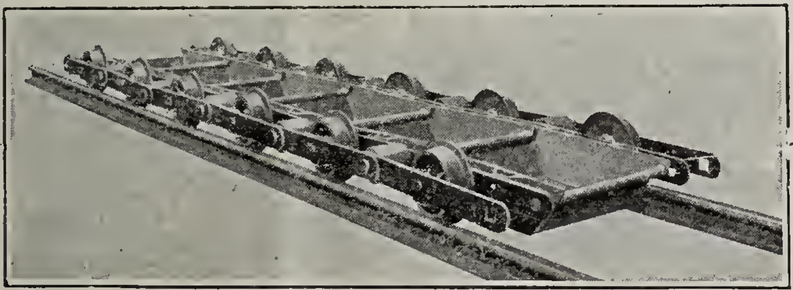

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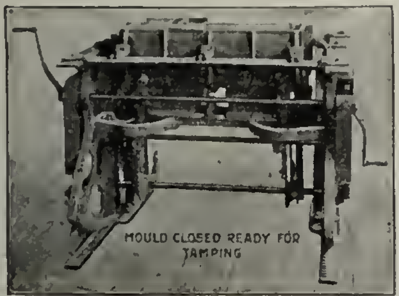

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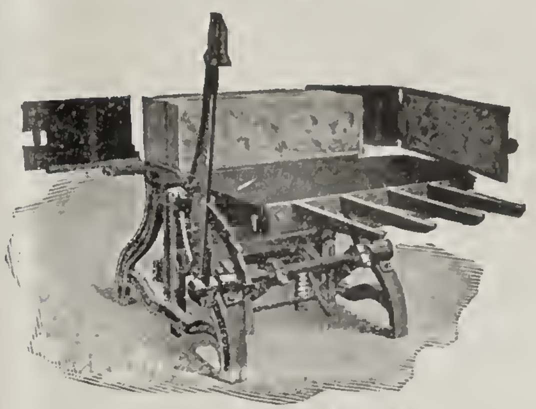

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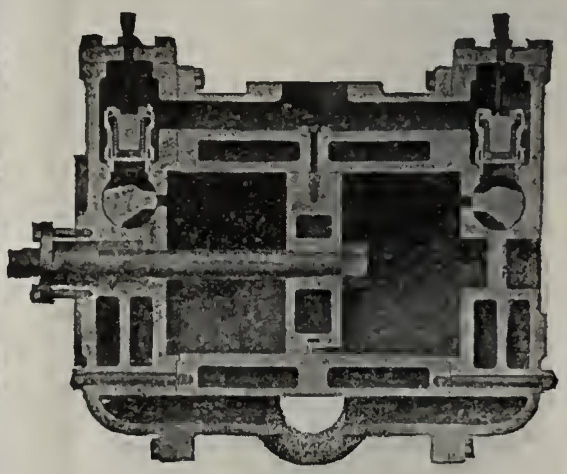

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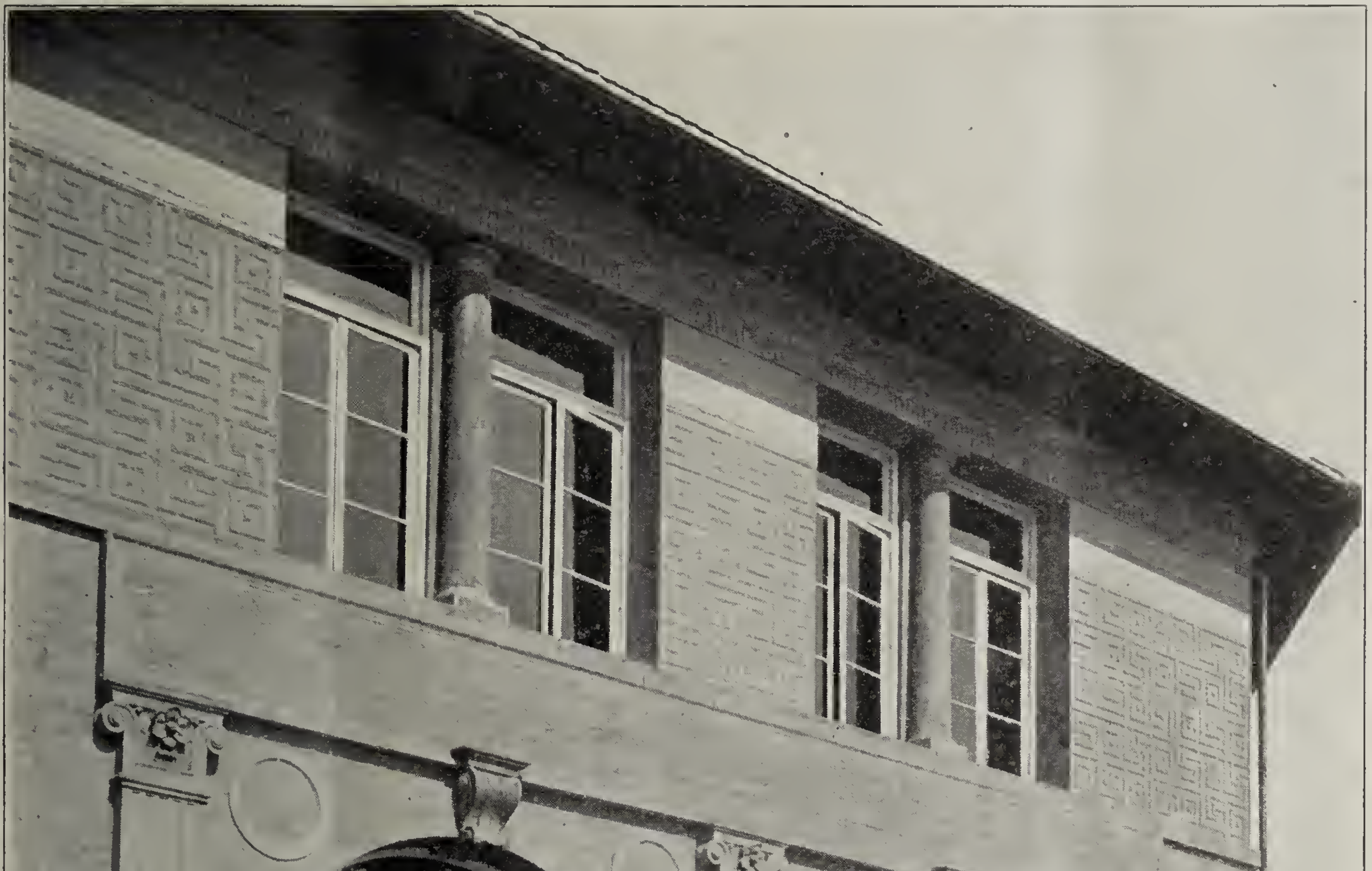

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D. H. Burnham & Co., Architects. Rudolph S. Blome Co., Chicago, Contractors.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
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CHICAGO, JUNE, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

ALLEGED INFRINGEMENT OF A BUILDING PATENT.

The Hennebique Construction Company, a New York corporation, instituted suit to-day in the United States Circuit Court against the Armored Concrete Construction Company, the G. A. Fuller Company and the Maryland Life Insurance Company, asking for an injunction to restrain the defendants from an alleged infringement of patents held by the complainant concern. It is stated in the bill of complaint that the defendants have used, and are still using, a method of reinforced concrete construction upon which the complainant holds patent rights. Besides the injunction, an accounting is asked of all profits alleged to have been received by the defendants through the use of the reinforced concrete. W. B. Whitney is counsel for the Hennebique company.

THE CEMENT INDUSTRY.

The American cement industry is in a flourishing condition. Prices are firm with an upward tendency. There may be a shortage before the close of the season. Some of the mills have closed out stock on hand and are working on orders. This is a healthy condition. Yet prices are reasonable and satisfactory to the consumer. The manufacture of cement has now reached a stage that calls for the most competent supervision in order to keep abreast of the keen competition which exists in the industry. The output for 1905 has been estimated at 30,000,000 barrels.

The older plants are enlarging to meet the increased demand. There are few opportunities for new plants, unless exceptionally favorable conditions exist, or where excessive freight rates from the nearest mills to the consumer and the demand is sufficiently regular to justify the erection of a Portland cement mill. The field for the cement mill promoter has been narrowed down to the smallest possible margin. Bankers in the middle West are observing the greatest possible caution in placing funds in new or old Portland cement enterprises today, especially when the promoters are novices who are pushing their projects on broad claims of 50 per cent assured dividends, while actual facts show that 7 per cent dividends are not always reached.

While we look for a continuous expansion from year to year along conservative lines, we must recognize the fact that boom times in the American cement industry are over.

A NEW CEMENT CHURCH.

The new Methodist church building at Cheboygan, Mich., dedicated May 28, is the largest cement church edifice in the state. The dimensions are 83 feet long, 60 feet wide and 40 feet high. The tower is 80 feet above sidewalk. The building cost $16,000.

SIDERO CEMENT.

The new iron ore cement, controlled by F. Krupp, of Essen, Germany, which is to be known as "Sidero Cement" in which the aluminum in the clay is replaced by metallic oxides, such as iron, manganese and other ores. Patent for this cement has been pending in the U. S. since 1900, and possibly may never be allowed because the formula for its manufacture was known and published over 25 years ago by German cement experts, and particularly by Michaelis and Schott. Prof. S. B. Newberry in 1897 discusses the formula in the Constitution of Hydraulic Cement, page 11, and made cement according to the following formula, containing 7 per cent iron oxide: $3CaO\ SiO_2$; $ZCaO\ Fe_2O_3$, producing a fusible block clinker, powder dark gray, pat slow-setting, set hard 28 days. Hot test, sound, hard on glass.

Sidero cement is said to be stable in sea water and can be produced at a lower temperature in the kiln than the ordinary Portland cement clinker. It may be produced in various colors depending upon the particular metallic oxide substituted for the aluminæ. Iron ore yields a brown and chocolate color, the same colors that the metallic oxides produce in glass can be obtained in cement not so brilliant, however. It sets in about 3 days and has a greater compressive resistence than Portland cement. In 7 days 11,000 pounds, 16,000 pounds in 90 days neat and with 1 to 3 mortar days 5,915 pounds, 1 year 1,143, 2 years 8,757 pounds. The Texas Portland cement companies' product is almost identical with the Krupp Sideio cement formula, which with a high burn gives a light colored cement.

RELIANCE CEMENT COMPANY.

The full allotment of securities of the new Reliance Cement Company, consisting of $360,000 first mortgage 6 per cent bonds, $150,000 7 per cent preferred stock and $240,000 common stock, has been subscribed. No figures are given to indicate what proportion of the new securities was taken by American Cement stockholders and the underwriters. Construction has already been started upon the works of the new company, which are located on land leased from the American Cement Company, near Egypt, Pa. The output of the new company will be marketed by the American Cement Company.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	APRIL				TEN MONTHS ENDING APRIL			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom.	2,576	$126	....	....	43,909,048	$139,761	6.997,424	$22.910
Belgium	6,810,988	19,436	964,714	$32,445	171,827,426	517,640	139,602,052	451.863
France	3.855.152	10,603	752.300	2,570	10,419,692	35,539	6,263,599	24,283
Germany..........	29,944,573	96,943	8,294,768	26,510	326,887.018	1,112,244	177,667,598	599.281
All Other Europe.	422,460	940	....	.... ..	5,321,352	14,590	1,227,501	4,224
British North Am.	....	....	....	....	890.515	4.162	152.915	1,049
Other Countries..	....	....	....	....	3,265,148	13,275	1,871,264	7,166
TOTAL	41,035,749	128,048	18,692,782	61,525	562,520,199	1,837,211	333,182,353	1,113,776
Domestic Exports of Cement, bbls.	30,736	41,075	120,082	141,999	249,316	372,478	845,758	1,189,260

There were 11,894,399 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in April, 1904, valued at $37.392, against 8,659,149 lbs. in April, 1905, valued at $29,083.

Imports of asphaltum or bitumen for April, 1904, were 10,152 tons, valued at $37,934; against 9,037 tons in April, 1905, valued at $28,826.

For ten months ending April, 1904, there were 134,860 tons of asphaltum imported, valued at $426,113, against 98,605 tons. imported in ten months ending April, 1905, valued at $447,291.

THE POSITION OF THE BLOCK MACHINE MANUFACTURER TO THE PUBLIC.

By O. N. Miracle.

(Read before the Concrete Block Machine Manufacturing Association.)

I believe if we can come to a mutual realization of the importance of "The Position of the Block Machine Manufacturer Relative to the Public," that is, if we can each get down to the gist of just how important a position we are occupying in this matter, we will have been well repaid for attending this meeting, and our customers and the public will largely profit thereby.

The cement industry has certainly made very rapid strides during the past decade. The business has proven so inviting and reassuring to the investor that capital has sought a place in the field rather than wait to be invited; the returns have been highly satisfactory. The cement mills of this country represent the investment of many millions of dollars, and through careful and conservative management and co-operation they have paid handsome dividends.

The business of manufacturing concrete building blocks is but a small portion of the concrete industry. While this business as a commercial proposition is a matter of very recent development. Five years ago the cement building block was comparatively unknown. There was but one make of machine in the field for the manufacturer of concrete building block—that of H. S. Palmer—while to-day there are upwards of 4,000 plants in operation in different sections of the United States; some towns having only one, while others have as many as twenty. There are at the present time about one hundred different machines manufactured and offered for sale. The concrete block is here to stay. It is known in every nook and corner of this country, and its use is very rapidly increasing. It fits into any place wherever brick and stone were ever used; and besides being better and more durable is in most cases cheaper.

While the large majority of the plants that have been started for the manufacture of concrete blocks are highly successful, there have also been some failures. Because it was a new proposition, because it held out alluring profits, because small capital was required to start, men have been attracted to this business from all lines and professions. The great majority have been successful, and today find their balances on the right side of the ledger. But, as I have said before, there have been some failures, and right here we might as well stop and ask for the reasons. There are many reasons, some legitimate, and some not. So long as men are mortal there are bound to be some failures. Some have gone into the block business who would make a "fizzle" in any line. There is no remedy for them. But, on the other hand, others who are in reality good business men and who have been successful before in other lines have either failed in the block business, or have not met the measure of success they should have, for other reasons. The main one being lack of knowledge and information, which should have been given them by the man who sold them their machine—who started them in business. This is the one great difficulty we meet, and I shall propose a remedy later on.

While we must certainly not pose as public benefactors, at the same time I believe it is necessary for us to face the condition as it is and admit that we, as manufacturers of cement block machines, are to a certain extent responsible to the public for the class of material that is turned out. The block manufacturer is nine cases out of ten is not familiar with the business; having no reliable literature upon the subject, he naturally gets his first instructions and first information about the business from the man who sells him his machine. Many of these salesmen have been inclined to paint the proposition altogether too rosy, in fact some have actually misrepresented it; they have over-estimated the amount of profits that can be made in the business.

As a sample of some of the stories that these salesmen tell, a customer recently came into my office who was in the market for concrete building blocks, expecting to be used for a residence. He had been told by the agent for some block machine that he could buy a machine, start making the blocks on Monday with two men, and have another man commence laying the same blocks on the following Tuesday, and have them all laid in the wall inside of twenty-four hours after they were made. But this preposterous proposition hardly compares with the statement I heard a "would be" salesman for a block machine make over in Canada the other day, when he said that cement blocks could be made of a mixture of one part of cement to ten, fifteen, or even twenty parts of sand. In fact, he said, it wasn't material, just so there was some cement used. And I want to impress upon you that you owe it not only to our customer, but to the public, to provide the manufacturers with reliable and dependable information upon the actual manufacture of the goods.

I have stated that this cement block business was a very attractive field for the investor. I want to tell you some of my reasons. In the first place, it promises to outstrip all other building materials in general use. The fireproof and everlasting qualities of this material appeal to the architect. Its beauty, cheapness and durability appeal to the intelligent builder. A comparatively small investment is required to engage in this business, as compared to the business of manufacturing any other line of building material, such as brick, terra cotta, lumber, etc.; the profits on this investment, and the fact that the field is unlimited, entirely remove any hazard to the investor in a plant for the manufacture of building blocks. The keynote of the whole situation, however, is in this as well as in all other business ventures, confidence. This material must be firmly established. It must have the confidence of the architect, the contractor, the builder, the confidence of the owner, the confidence of the legislator, the confidence of the insurance company, and the confidence of the public in general; and it is up to us to help create this confidence and maintain it. It has been said that "A chain is no stronger than its weakest link." The links of evidence in this case are in our hands. Let us see to it that every link is carefully welded; that there are no weak ones. We have many trade rivals, whose fields we have usurped; whose outlet for material the cement block has cut off, and who are jealous of our success. They are constantly on the alert for a chance to pick one little flaw, and once found they never stop talking about it. A small defect like one cracked block, or a small check in a wall grows as it passes from mouth to mouth until the building becomes a complete wreck in the minds of those who hear the story, and the material is condemned by those who haven't seen it.

Cement building blocks have also been the subject of vicious attacks by many insurance people. While these attacks are unjust and unwarranted, and in most cases due to ignorance, and prompted by friends of other building material, I have found upon running them down that they do not generally come from reliable sources, that is, they do not come from the heads of departments who make standard tests of fireproof materials for rate-making purposes, but usually from prejudiced agents in the field, whose only motive that I can see, outside of their warm friendship for the brick men, and their fear of smaller commissions on account of decreased rates which are bound to obtain in cement constructions. One agent in Omaha wrote to our customer that he couldn't make a rate on the concrete block building because a building somewhere, built of hollow blocks, had exploded during a fire. I asked him for more specific information on the subject, but he declined to reply. Another insurance man, of Cedar Rapids, Iowa, who has something to do with rate making in that state, wrote a customer at Cincinnati, Iowa, that concrete building blocks generally were bad, and should be condemned, but that there was one form of block (some mysterious shape, the name of which he declined to divulge) that was fireproof, but the patentee had not yet placed the same on the market. I, of course, assured the gentleman that I presumed he would be willing to stand corrected, as I supposed, of course, he referred to the Miracle Block, and begged to advise him that the same was being marketed pretty lively in different sections of Iowa, but he declined to reply to my first three letters, finally I received the following answer from him: "Cement blocks take a higher rate than brick." These are some of the difficulties we meet. After remarkable periods of progress there always come times of reaction and depression. The time has now arrived for a reaction in this business if it is left to drift on alone. Our competitors, the brick men, present an organized front.

In a recent copy of the "Clay Worker" I find an article headed "Cement Block Makers in Trouble." The writer of this article takes up two columns of space to say that the cement block industry is "up against it," and that before the manufacturer of cement building blocks can do any more business he will have to guarantee that the cement block will make as dry a building as can be made of brick. He also goes ahead to state by way of comparison that the brick maker seeks to supply the demand, while the cement block manufacturer starts out with the idea of creating a demand. It would be useless to take up your time discussing such rot, but I merely mention it to draw attention to the fact that the clay people are busy. They realize the enormous inroads the cement block industry is making on their business, and through their various organizations they are attempting to condemn the cement building blocks, for which I think we may heartily thank them, because in this case, as in all others, "every knock will prove to be a boost," and whenever they mention the cement block they are advertising it, whether it is mentioned adversely or not. But here again comes in this question of organization. The various lines of building material opposing concrete are organized, and we must meet their organization with counter organization. By way of illustration: In 1901 the freight handlers of Chicago went on a strike, dropped their work entirely, and with the effort of a sympathetic strike of the teamsters, who were also on a strike, won every point they asked for against their employers—simply because they were thoroughly organized, and their employers were not. Last April the teamsters of Chicago again struck in sympathy with some minor garment workers' union, and to-day they have practically lost out, because the employers are organized as well as the unions, the strongest organization being that of the employers. Hence the results. While ours is by no means a parallel case, this illustrates plainly that it is time for organization, for unity of effort and concerted action, and this is the remedy I propose: We should here perfect a thorough organization of the cement block machine manufacturers of the United States; invite every manufacturer, whether large or small, and make the initiatory fee large enough to create a fund to do business with, and pay this fee before leaving this hall; appoint a committee at once, who will get immediate action on the matter of drawing up standard specifications for cement block making, such as will be approved by the best engineers of this country and the insurance people; put a copy in the hands of every man now manufacturing cement building blocks; supply each manufacturer of block machines with sufficient copies so that he in turn may supply his salesmen and customers and go on record before the world for a material, the quality of which must be unquestioned. If you have a salesman in the field who is inclined to misrepresent this material, or the manner in which it should be made, tie him down to these standard specification, and if he varies from them one iota, dismiss him at once. The block maker in most cases gets his first ideas of the concrete business from the salesman, and if there is any poor material made in the future it can be traced directly to the door of the salesman. The salesman must be right. He must be honest with his house, honest with the customer, and honest with the public. Let our watchword be Confidence. Let us merit this confidence—an honest product honestly made and sold at a good profit.

The United States Standard Cement Company, Louisville, Ky.; capital, $1,000. The incorporators and their holdings are Albert Boyd, Glasgow, 50 shares; Luther D. Boyd, 200 shares; Moody Boyd, 200 shares. The maximum debt is limited to $1,000.

Painsville Concrete & Building Co., Painesville, O.; object to manufacture blocks; E. D. Rust, E. C. Vesy and J. H. St. Waters, directors.

NEW BUILDING BLOCK FACTORIES.

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Harry Woodstock, Whittier.

Illinois.

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J. F. Martin, Arthur.
C. S. Jones & Co., Bloomington.
Wm. Smith, Jr., & Sellar Mosley, Washington.
Thos. A. Galt, Rock Falls.

Indiana.

C. S. Wert, Kendallville.
Schuyler, King & Co., Princeton.
J. H. Mitchell, Goshen.
Noah Bogard, Washington.
Lewis McNutt, Brazil.

Iowa.

The Grandview Lumber & Coal Co., Wapello.
J. S. Layton & Son, Shenandoah.
L. R. Davis & Sons, Centerville.
L. H. Babb, Farmington.
Climax Cement Block Co., Rock Rapids.
The Electric Concrete Post Co., Lake City.

Kansas.

F. R. Lanter, Olathe.

Kentucky.

Frank Asbury & R. L. Jameson, Latonia.
C. G. Duke & Sons, Hopkinsville.

Michigan.

J. E. Reynolds, Muskegon.
Taberham & Yarnell, Cadillac.
Pidgeon, Davey & Co., Constantine.
The Bradley Cement Block, Adrian.

Maryland.

Gallaher & Colbert, Warsaw.

Minnesota.

Thompson & Johnson, Glenwood.
Louis Larson, Hallock.
Lewis Larson, Wallock.
J. R. Reeve, Morris.
Olson Bros., Ivanhoe.

Nebraska.

J. K. Butz & J. W. Goodwine, Potomac.
The Robinson Artificial Stone Plant, Stanton.

North Dakota.

The Cooperstown Tile Works, Cooperstown.
Ole Moe, Leeds.
Hugh Dickinson, Velva.

South Dakota.

Albert Brash, Button.
Nels Erickson, Fargo.
Johnson & Peterson, Oldham.
Bartine & McLain, Oacoma.
R. R. Pember & Co., Hecla.
Greig & Zeeman, Emery.

Ohio.

Lemley & Halby, Circleville.
Cement Ventilating & Stone Co., Columbus.

Pennsylvania.

Charles Hendler, Wilkesbarre.

Wisconsin.

Blake Bros., Madison.
George L. Smith, Wausau.

CONCRETE FIELD HOUSES BUILT FOR SOUTH PARK COMMISSIONERS AT 330 SHIELDS AVE., CHICAGO ILLINOIS.

D. H. Burnham & Co., Architects; Rudolph S. Blome Co., Contractors.

The South Park System of Chicago has, during the past two years, purchased numerous sites for small parks in the thickly populated sections of the South Side of said city, for the purpose of affording that part of the public living a considerable distance from the larger parks more frequent opportunities for recreation and outdoor amusements. On these sites are being constructed Field Houses or Neighborhood Assembly Buildings, consisting of a Main or Assembly Hall Building, Men's and Women's gymnasiums, plunges, swimming pools, wading pools for children, boiler house, etc.

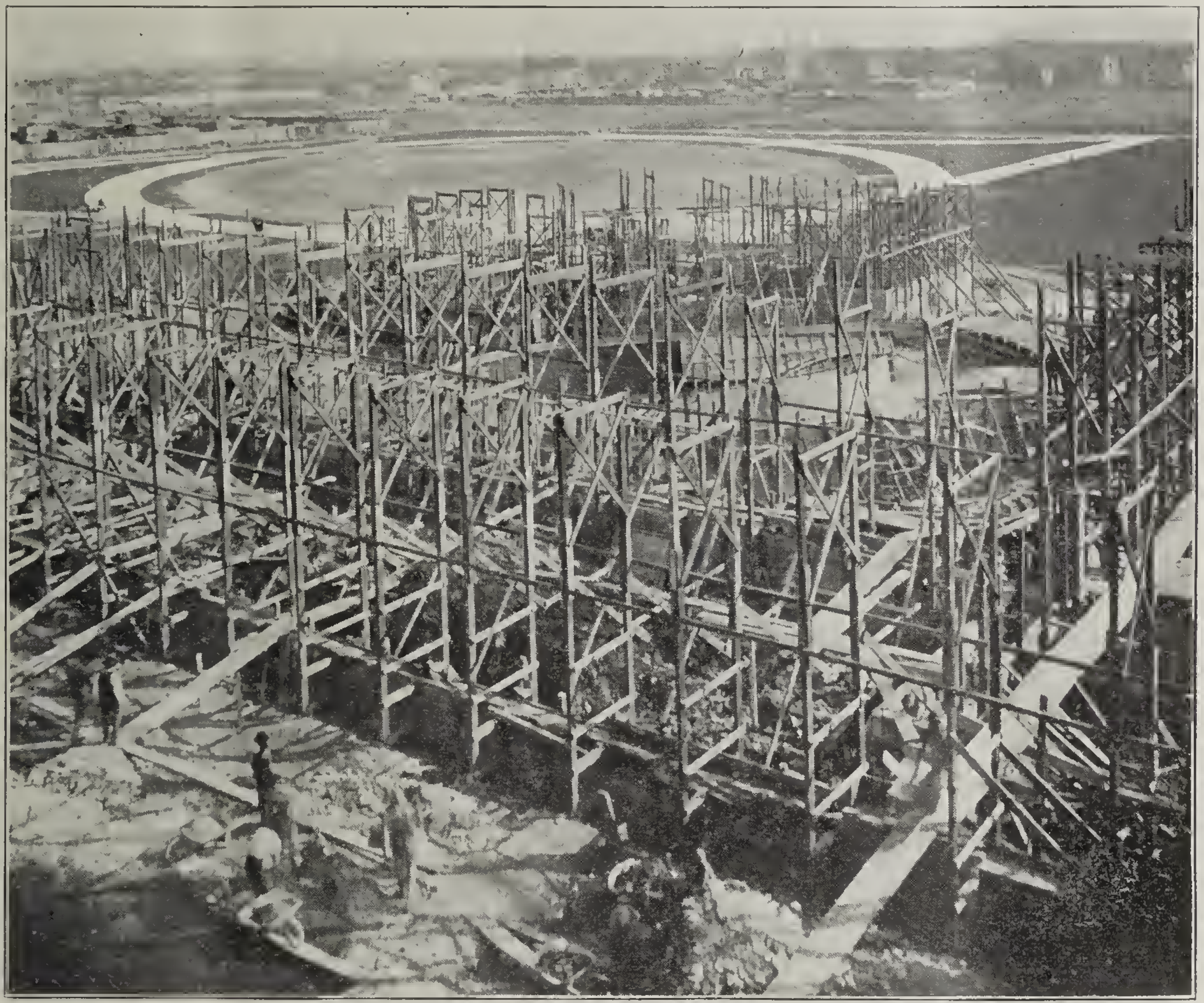

Fig. 1. A Bird's-eye View of the Arrangement of False Work for the Construction of the Concrete Field Houses at Shields avenue and Thirty-third street, Chicago, built for the South Park Board.

The rapidly increasing application of concrete for building construction, and the amply demonstrated practicability and durability of such construction, also as this material was peculiarly adapted for their buildings as designed, induced the South Park Commissioners to let contracts for buildings of this construction at some eleven or twelve different parks.

The first contract was awarded to Rudolph S. Blome Company, the well known concrete contractors, who have now completed seven of these buildings, an examination of which will convince the most skeptical. The buildings are entirely of concrete, including walls, columns, partitions, lockers, conduits, etc.

The accompanying are views of the method of construction, and of the finished buildings erected by the company named at Park No. 3, located at 33rd street and Shields avenue, and covering a ground space 180 feet square, the total cost aggregating $100,000.00.

View No. 1—A bird's-eye view of the general arrangement of the form or false work.

View No. 2—Plainly showing detail of the method of forms employed.

View No. 3—Is a close view of corner construction.

View No. 4—Looking from southeast at the finished main building in foreground, with south and east end of gymnasiums showing at sides.

Fig. 5 shows the southeast front of the Main Building and a portion of two other faces.

View No. 6—Is a close view showing detail of ornamentation, etc., at main entrance to Main Building.

View No. 7—Shows locker arrangement and construction, also swimming pools, walks, etc., in interior court.

To determine the most satisfactory materials for the aggregate it was found, after numerous experiments had been made, that to produce the uniformity of color desired and for compactness a mixture of fresh limestone screenings, free from dust, and one-quarter inch crushed stone together with a certain proportion of coarser crushed stone, brought about the best results, and no sand was used above ground level. The concrete was mixed in the proportions of one part Vulcanite cement, two parts limestone screenings, and four parts of a mixture of the one-quarter inch and the larger crushed stone. No mortar facing was applied anywhere, but dressed and matched lumber used, the concrete mixed fairly dry, and carefully tamped uniformly compact.

As to the method of form work and details thereof, The Rudolph S. Blome Company, contractors for the work, say:

"We would prefer to have your readers get their own ideas from the photographs, which shows the method of construction quite plainly, as this is more or less of a trade secret, and also as our experience in false work has enabled us to put up buildings far superior in appearance, etc., to those built by other contractors for the South Park Commissioners.

"We will, however, state that 2x10-inch dressed and matched lumber was used for form bracing, and, as you will note from the photographs, 6'x6" lumber was used for the main uprights, which extend to the full height of the walls, two uprights being erected along outside of wall, wheeling platforms supported between these two latter uprights, and the form work braced from the uprights next to inside and outside of walls. These three uprights prevent any swaying, even though they were spliced for the two-story building, and we see no reason why the same system could not be used successfully for high buildings."

All concrete for the one-story building was wheeled up on run-abouts, while above the second floor it was hoisted at center of building.

The pilasters, keystones and rosettes were cast in special molds and set in place, but the water table, frieze work, cornice, etc., were produced by negatives nailed inside of the forms, and the same mixture of concrete used throughout.

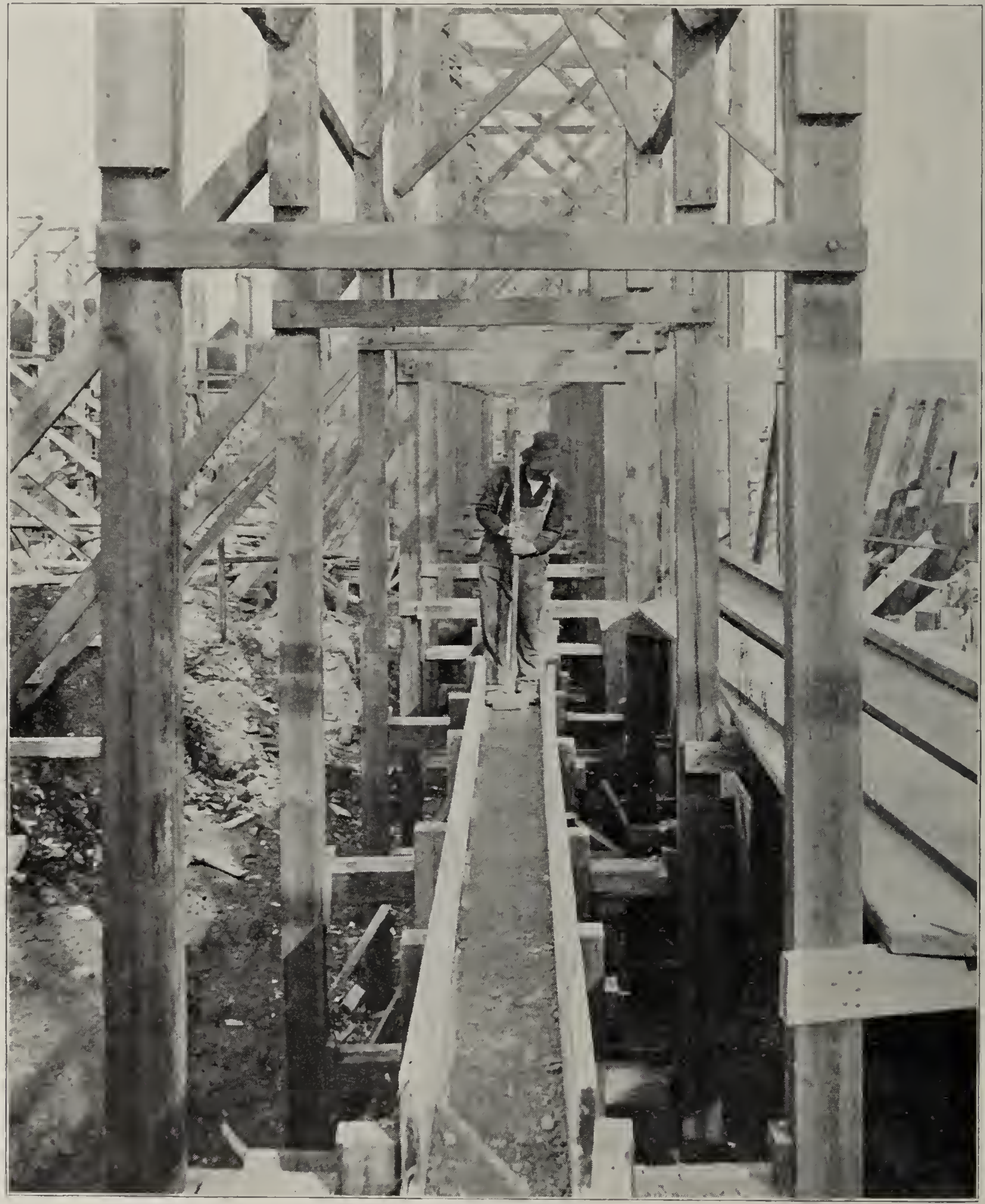

Fig. 2. Showing Detail of Method Forms Employed.

As previously mentioned, the concrete was mixed fairly dry—that is, only sufficient water was used so as to permit of thoroughly tamping the concrete without causing the mortar to ooze, or run down in streaks, and the result has been that the buildings have very nearly the appearance of Bedford stone, except of course that they are grainy in appearance and not lined off in blocks.

No plastering of any kind was done, the walls simply being calcimined in various tints, and the buildings as a whole, both externally and internally, presented an unexpectedly pleasant effect.

As the first floor is more than 4 feet above the sidewalk level, and as there are no basements except in boiler room, no waterproofing was necessary except a mortar coat on outside of the walls of boiler in basement. The contract price for the work was about $100,000.

Under the custom tariff of Canada, revised May 1905, the duty on Portland Cement, hydraulic or water lime in bags, barrels or casks, the weight of the package to be included in the weight for duty, is 12½ cents per 100 pounds. The duty on manufactural wares of cement is 20 per cent ad valorem.

SOME RESULTS OF RESEARCH WORK ON PORTLAND CEMENT AT THE UNIVERSITY OF MICHIGAN.

BY E. D. CAMPBELL, PROFESSOR OF CHEMICAL ENGINEERING, UNIVERSITY OF MICHIGAN.

The manufacture of Portland cement is a strictly chemical process, since it involves complete change in the relations between the materials going to make up the clinker from which the cement is produced by grinding. The three essential constituents of Portland cement are silica, alumina and calcium oxide or lime. Ferric oxide, magnesium oxide or "magnesia," the alkalies potassium or sodium oxides, and sulphuric anhydride are usually present, but are not essential constituents, although they may exert a marked influence during the formation of the clinker or upon the physical properties of the finished cement.

It has been stated by one of the most eminent authorities in Germany that Portland cement can be made from any clay or shale with any limestone or marl, provided the amount of magnesium oxide is not too high. While the above statement in general use is true, it does not mean that Portland cement of equally good quality can be made from any kind of raw material. When the Portland cement industry began to assume such an important place in this state, the author realized that it would be necessary to have a much better knowledge of the conditions which determine the constitution of clinker before the industry could be put upon a really satisfactory basis. Although thousands of physical tests had been made upon finished Portland cement, in very few cases was the complete history of the clinker, from which the cement was made, known; that is, in very few cases was the complete chemical composition of the clinker, the temperature at which it was burned, or the length of time and conditions under which it was kept before making into briquets or test bars, stated. The

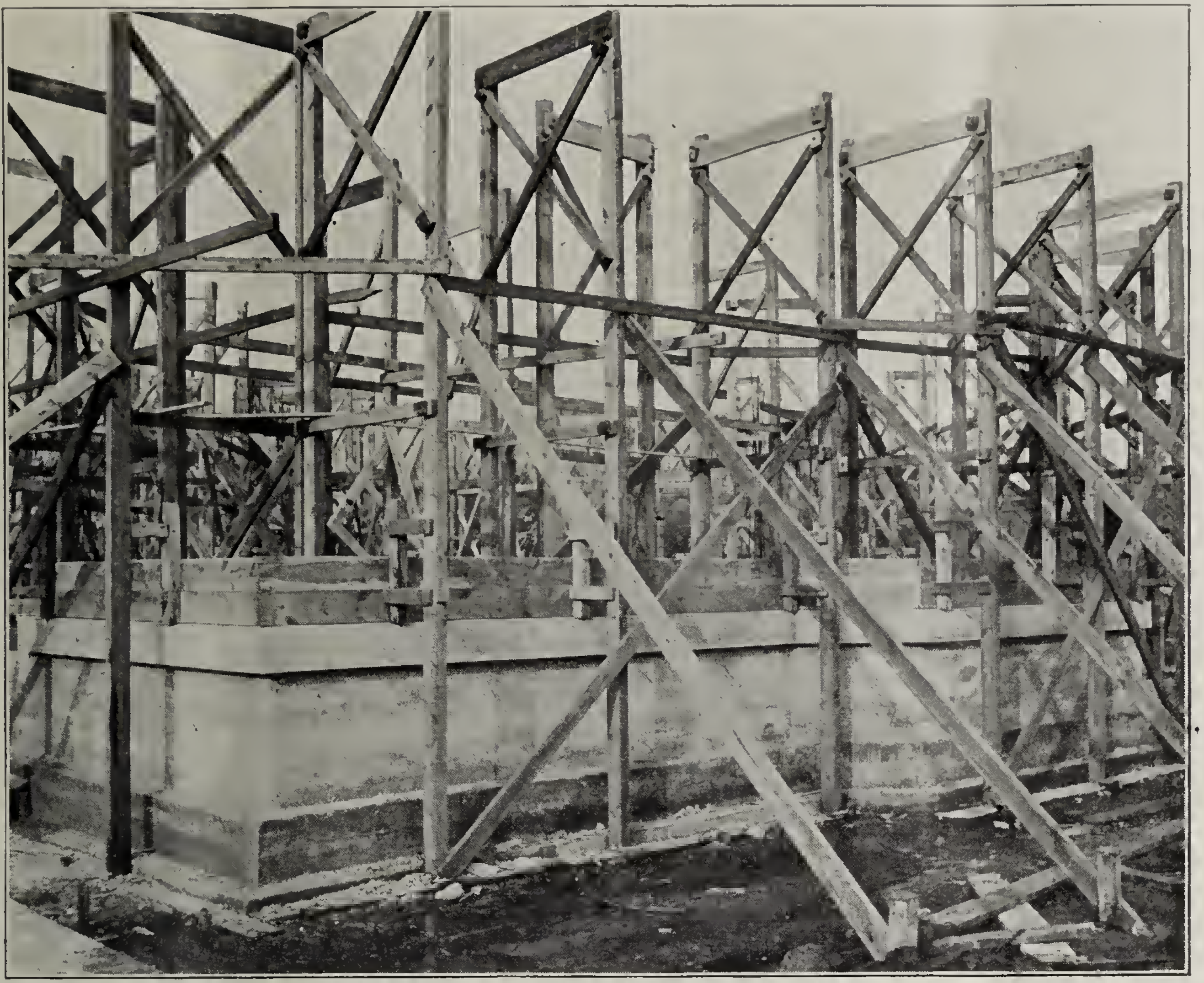

Fig. 3. A Rear View, Showing Corner Construction.

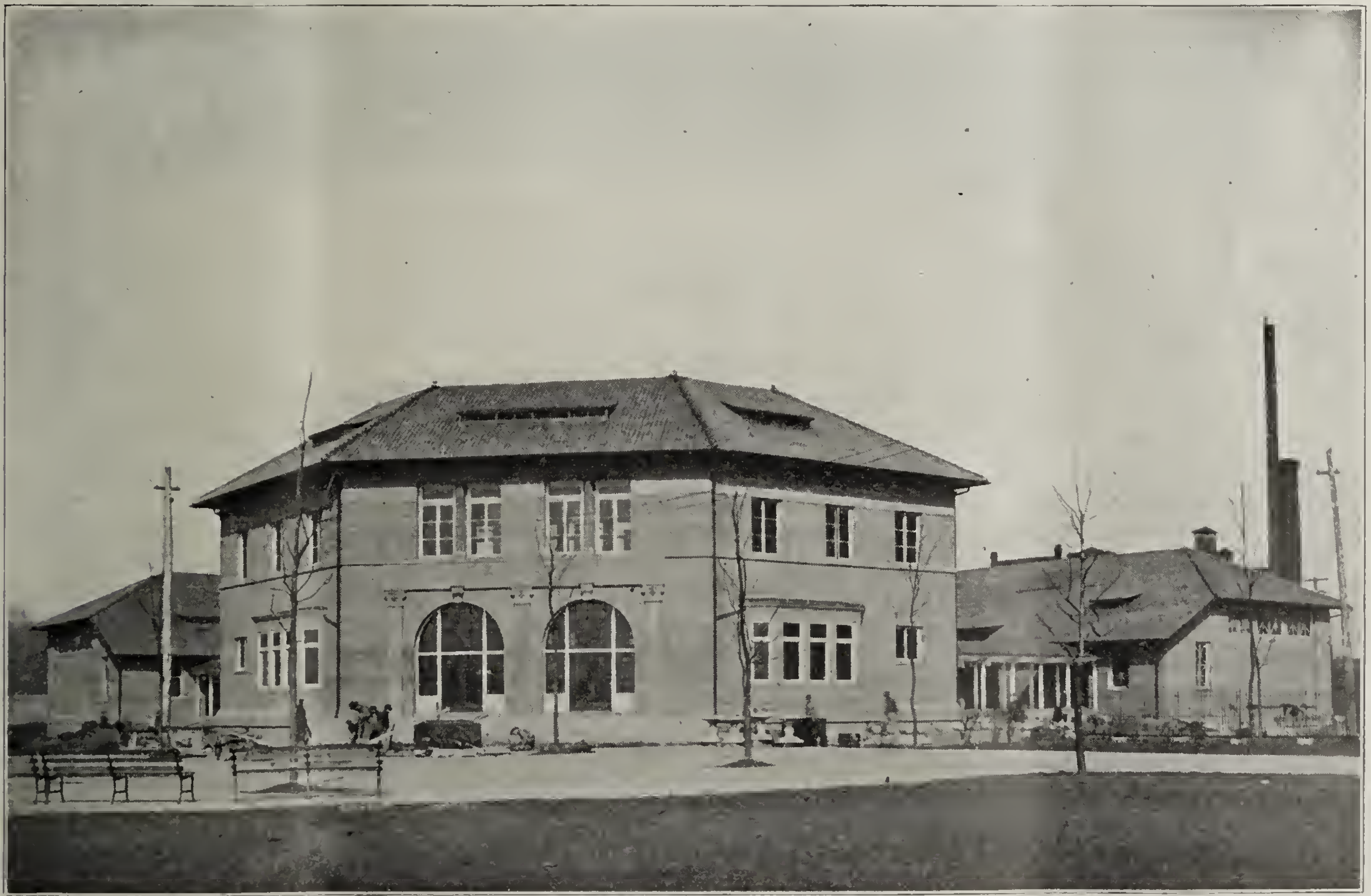

Fig. 4. View Looking from the Southeast at the Finished Main Building in Foreground, with South and East End of Gymnasiums Shown at Either Side.

physical properties of the finished cement will depend primarily on the constitution of the clinker, and it was for this reason that the researches, begun in this laboratory in the spring of 1899, had for their object the study of some of the conditions which go to determine the constitution of the clinker.

The first experiments undertaken were performed in small stationary furnaces and produced clinker very similar to that made in large commercial fixed kilns. Experiments were carried on for something over a year, using a stationary furnace, but it soon became evident that the temperature of the furnace and the duration of the heating were two factors in the process of clinkering which were of nearly as great importance in determining the constitution of the clinker as the chemical composition of the clinker itself. In nearly all modern cement mills the rotary kiln is employed and it therefore became desirable to have a small rotary furnace, in which the temperature could be accurately measured, the time of passage of the material controlled, and the chemical composition of the gases constituting the flame from the furnace determined. After some months of experimenting, such a small rotary furnace was constructed and most of the cements made in this laboratory during the past four years have been burned in this furnace. The temperature within the furnace is measured by means of a modified La Chatelier pyrometer, easily sensitive to less than one degree when working at the highest temperature employed in making clinker, something above 1600°C. A full description of this rotary cement kiln for use in the laboratory can be found in the Jour. Amer. Chem. Soc., March, 1902.

When a satisfactory form of furnace had been devised, a preliminary set of experiments was planned to determine the influence of variations in chemical composition of the raw mixture on the temperature required for producing sound cement. To this end, mixtures were made from clays or shales with marl in such proportions that the influence of the substitution of Al_2O_3, for SiO_2, of Fe_2O_3 for Al_2O_3, of MgO for CaO, and of increase or decrease in the basicity of the mixture could be studied. Each raw mixture was passed through the rotary kiln and samples of the clinker were collected, beginning with a comparatively low temperature, usually about 1100°C., and increasing in intervals of 25 to 30°C. until a temperature was reached known as the "overburning" temperature, at which the material became so soft and sticky that it would not pass through the furnace. The various samples of clinker collected during each experiment were ground into cement and the amount of water for "normal consistency" and the time for initial and final sets determined. The pats made in the course of the determination of the time of setting were, after standing in moist air twenty-four hours, placed in cold water, which was then brought to the boiling point and maintained at that temperature for a second twenty-four hours. This "boiling test" served to give an excellent indication as to the soundness of the cement.

We desire to discuss more fully the phenomena connected with the clinkering as indicated by the soundness of the cement shown by the boiling test. A comparative study of the soundness of the pats after having been subjected to the action of boiling water for twenty-four hours shows most clearly the relation existing between the chemical composition and temperature of burning. In any series the successive pats show differences in behavior in boiling water. If the collection be begun below about 1250° C., the first pats will come loose from the glass soon after making, but will become quite strong and remain sound and free from cracks under the boiling test. As the temperature of burning rises the pats begin to crack more and more, then go to pieces, and finally nearly or quite completely disintegrate. With further increase of burning temperature, the extent of disintegration diminishes until, if the cement is properly proportioned, the pats again become sound and strong, remaining firmly attached to the glass. Further increase of temperature does not affect the soundness of the pat, unless carbon monoxide is present in the furnace gases. In this case the

Fig. 5. Southeast Front of Main Building, and Partial View of two Other Fronts.

pat may come loose from the glass, but will remain sound and strong.

For purposes of study, three points have been selected as indicating important changes in clinker. Such changes in condition of clinker may indicate formation of definite chemical compound, or changes in the phases, of a solid solution. The three points selected are, first, *temperature of maximum disintegration,* by which is meant the temperature at which the clinker was produced, which, when made into pats, showed the greatest disintegration in boiling water; second, *temperature of perfect boiling test,* by which is meant the lowest temperature at which clinker was produced, which, when made into pats, remained strong, free from cracks and firmly adherent to the glass after exposure to boiling water for twenty-four hours; third, *overburning temperature,* by which is meant the lowest point during the burning at which the individual pieces of clinker commenced to stick badly to each other or to the inside of the furnace. The influence of chemical composition will be discussed with reference to these three temperatures.

Temperature of maximum disintegration. For a given clay the ratio CaO to $SiO_2+Al_2O_3$ must reach a certain magnitude before the pats will completely disintegrate. Any increase in the calcium oxide over this minimum amount for any given clay does not increase the temperature of maximum disintegration. The temperature of maximum disintegration is lowered by increasing the time of passage through the furnace. When the ratio CaO to $SiO_2+Al_2O_3$ is enough for complete disintegration, the addition of MgO does not change the temperature of maximum disintegration. The substitution of R_2O_3 for SiO_2 materially raises the temperature of maximum disintegration. For a given clay the amount of water required for normal consistency increases with increase of CaO, provided the time of passage through the furnace is kept constant.

Temperature of perfect boiling test. For a given clay the burning temperature necessary to obtain a perfect hot test increases with increase of CaO. This temperature is lowered by increase of time of passage through the furnace. When the ratio of CaO to $SiO_2+Al_2O_3$ is enough to insure a perfect boiling test at some temperature, the addition of MgO does not materially raise the temperature necessary to obtain clinker giving a perfect boiling test. The substitution of R_2O_3 for SiO_2 lowers the temperature for a perfect pat when the ratio of CaO to acidic oxides is low. With increasing amounts of CaO the temperature for a perfect hot test is increased and the point is soon reached when a perfect hot test cannot be obtained at all. The amount of water required for normal consistency varies within slight limits, but does not rise over 25 per cent irrespective of the clay used and the composition of the cement.

Overburning temperature. For a given clay the overburning temperature increases with increase of CaO. The overburning temperature is lowered by increasing the time of passage through the furnace. MgO may replace CaO molecularly up to an empirical formula, $2RO.\ SiO_2$, $2RO.\ Al_2O_3$, $2RO.\ Fe_2O_3$, without much change in overburning temperature. When the CaO is at least $2CaO.\ SiO_2$, $2CaO.\ Al_2O_3$, $2CaO.\ Fe_2O_3$, the addition of MgO raises the overburning temperature only slightly, not nearly so much as an equivalent of CaO.

Viewed from the standpoint of the influence of chemical composition upon the changes in temperature necessary to produce a sound cement and the temperature at which the clinker will give trouble by sticking in the rotary, we find that the minimum temperature to produce Portland Cement which will give a perfect pat test from fresh clinker is about 1450°C. This temperature is for a minimum amount of CaO. It increases with increase of CaO until in ordinary commercial cements it reaches 1550°C. With the most heavily limed commercial cements this figure would be somewhat higher. It depends somewhat on the length of time required to pass through the rotary, slow driving tending to lower the temperature. The substitution of Al_2O_3 or Fe_2O_3 for SiO_2, that is the use of a richer clay lowers the overburning temperature required for a perfect boiling test. With mixtures low in CaO the burning temperature for perfect boiling test is lowered by this substitution, but with mixtures high in CaO the burning temperature required for perfect boiling test is raised and may become coincident with the overburning temperature. Any attempt to raise the overburning temperature by increasing the proportion of lime will fail to give a perfect hot test even at the overburning temperature. This is a confirmation of manufacturing experience—that with lean clay heavily limed, there is a wide margin between the proper clinkering temperature and the overburning temperature, while with rich clays in order to prevent the clinker from balling up, great care must be exercised to maintain the proper clinkering temperature. With the amount of CaO found in ordinary cement, the introduction of 8 or 9 per cent of MgO has but little influence on the temperature for perfect boiling test or overburning temperature. So far as the clinkering is concerned, magnesia, as has been maintained by Newberry, acts as an inert substance. The details of the experiments from which the above deductions are drawn will be found in the Jour. Amer. Chem. Soc., October, 1902.

During the following year a set of experiments was made to determine the influence of the fineness of grinding of the raw material upon the clinkering process. The material employed was a raw mixture used by one of the Lehigh Valley Cement companies. Twenty-five samples of clinker were made from this material used just as it is ordinarily fed into the large rotaries used at the works. The temperature at which these samples were collected ranged between 1000°C. and 1625°C. Another set of twenty-four clinkers was also collected at approximately the same temperatures as those employed in the preceding cases, the only difference being that in the second set of experiments the raw material was ground so that 98 per cent would pass a two hundred mesh sieve. The results of these experiments showed, first, that unless the material is finely ground, a perfect boiling test cannot be obtained even when the material is burned at over 1600°C.; second, that the process of clinkering takes place in several steps which are indicated by well marked changes in the amount of water required for normal consistency, in the time of initial and final sets, and in the behavior of the pats under boiling tests; third, that with *finely ground* raw material such as is used in the Lehigh Valley district, a perfect boiling test can be obtained with clinker burned at 1475°C. The details of these experiments together with photographs illustrating the changes of color of the clinker with increasing temperature and the appearance of the pats after having been submitted to the boiling test, will be found in the Jour. Amer. Chem. Soc., November, 1903.

The marked changes in the behavior of the clinker produced in the previous experiments indicated that these changes in the time of setting and behavior under the boiling test were probably due to changes in the chemical relation between the CaO and the SiO_2, Al_2O_3 or Fe_2O_3. In order to determine whether this was probably the case, other experiments were carried on during the following year. These experiments included the preparation of mono and di-calcium aluminate, di-calcium ferrite and a cement made from mechanically mixed oxides. As in previous experiments, samples of clinker were collected at various temperatures and tested to determine the amount of water required for normal consistency, the time of setting, and the behavior of the pats under the boiling test. The results of these experiments were tabulated, plotted in the form of curves and compared with the results obtained in the previous work. A study of the curves for the finely ground Lehigh Valley material shows that the amount of water required for normal consistency falls off regularly with increase of temperature after the point necessary for complete dissociation of calcium carbonate has been passed, in this case about 1125° C. If we compare the curve for the initial and final sets in this experiment with those from dicalcium aluminate and dicalcium ferrite, we will note that in all three cases we find the final sets reaching a minimum at a temperature very near 1200°C. and that the initial set is rapid in all three cases at this same temperature. This would indicate that in cement, mixtures of dicalcium aluminate and dicalcium ferrite were probably the most reactive constituents formed at this temperature. The very marked slowing of the final set between 1200°C. and 1300°C. is probably due to some silicate formation, since this marked rise in the curve is absent from the curves of pure aluminates and ferrites. The sample of clinker collected at 1352°C. showed, as has been previously explained, maximum disintregration under the boiling test, together with a minimum amount of undecomposed silicates. Thus we would find this second valley, so to speak, in the curve of final set representing that period in the process of clinkering where we have most complete combination of the silica, but where the *tri*-calcium silicate, characteristic of normal Portland Cement has not as yet formed, or at least separated from solid solution. The rise in the curve between 1352°C. and 1475°C. is not improbably due to the gradual separation or formation of tricalcium silicate, perhaps accompanied by progressive dissociation of dicalcium aluminate and ferrite. The temperature at which the first perfect boiling test is obtained is 1475°C. Whether the gradual falling off in the time of final set with rise of temperature above 1475°C. is due to dissociation of tricalcium silicate and formation of the more quick setting dicalcium silicate, we are not prepared at this time to venture an opinion, since our work has not as reached a point which would justify positive opinion in regard to the behavior of the silicates themselves.

The experiments upon the cement made from mechanically mixed oxides showed that if a mechanical mixture of the various oxides constituting the raw mixture is finely ground it will after a temperature of 1200°C. is passed behave in practically the same way, so far as the clinkering process goes, as if the SiO_2 and Al_2O_3 had been combined as a silicate in the raw mixture. The details of these experiments with the curves are given in the Jour. Amer. Chem. Soc., September, 1904.

Comparatively early in the course of the researches begun in this laboratory, the author realized that it would be very desirable to have some positive information as to the cause of expansion in cement. It has been a matter of common knowledge for years that different cements expand to a different degree under the same conditions, but there has been a marked divergence of opinion as to the causes of these differences. Magnesia has been the material blamed for most of the expansion, although free lime also comes in for its share of blame. A long series of experiments was therefore planned with a view to throwing a little light on this vexed question of the change of volume in cement. A number of bars were made from cement of known history, that is, from clinker of known composition, burned at a known temperature, cooled at a known rate, and stored either as cement or clinker for a known length of time before making into expansion bars. These expansion bars are each 25 mm. square and 100 mm. long between the glass plates imbedded in the ends of the bars. Their initial length is measured by means of a special micrometer graduated to .01 mm. and capable of being read to .001 millimeter. Since the length of the bars is 100 mm. the expansion or contraction may thus be read directly in per cent. The initial measurement is taken twenty-four hours after the bar is made and subsequent measurements to determine any change in volume are made at intervals of seven, fourteen, twenty-one and twenty-eight days, two, three, four, six, nine, twelve and eighteen months, two years, three years and subsequent measurements at the end of each year. The results of these measurements are being kept in tabular form, as well as in curves and will be published in due course of time. There are at present something over ninety bars from which these data are being collected, some of them already having been under observation for over four years. Although the results of these experiments have not as yet been carefully collated, a few interesting facts seem to be pretty clearly indicated. First, the expansion due to MgO depends not upon the total amount of MgO but upon the condition in which it exists. Chemically combined MgO does not cause expansion in cement. Free MgO does cause expansion, this expansion, however, not being appreciable for nearly two months, but continuing, when the bars are kept in water for more than three years. If the bars are kept in *air,* it is questionable whether free MgO causes any appreciable alteration in volume. Free CaO causes rapid expansion of bars kept in water, the expansion due to the presence of free CaO ceasing, however, after about fourteen days. If the bars are kept in air, free CaO causes steady expansion extending over a period of several months. If expansion bars are made from freshly burned clinker either from a commercial rotary furnace or in the laboratory kiln, there is an irregular expansion for more than two years. If the cement from which bars are made is stored, the expansion of bars kept in water is markedly decreased, while if the clinker is first exposed to the weather for some months and the cement produced therefrom aged for a few weeks, the expansion of bars immersed in water may be reduced to practically nothing.

The conception that at the temperature of the kiln, clinker consists of a solid solution from which certain constituents may crystallize out, is steadily gaining ground among those interested in the study of the chemistry of cements. This idea was, we believe, first suggested by Erdmenger and about the same time by Ludwig in 1901. In an exhaustive article on the constitution of Portland Cement, which appeared in the Journal "Cement," Vols. IV., V. and VI., Clifford Richardson has carefully reviewed the literature concerning the ideas held by the leading cement chemists abroad and in this country and has elaborated upon the idea of clinker consisting of solid solution, giving his own theory as to the probable composition of the different constituents going to make up the clinker. The influence of the temperature and time of heating on the constitution of the phases existing in clinker has not as yet been satisfactorily established. The work done in this laboratory during the present year has had for one of its objects an attempt to throw a little light on this question and the work will be continued in hopes of contributing something that will be of use in the solution of the problem.

April 20, 1905, Ann Arbor, Michigan.

Concrete Block Dwelling House, exhibited at the Meeting of The National Association of Portland Cement Manufacturers at Atlantic City, N. J., June 14, 1905, designed by Wm. M. Kingsley Co., Western Reserve Building, Cleveland, Ohio.

NEWS ITEMS.

Since the destruction by fire of the Portland Cement Works at Johannesburg, South Africa, last summer, there has been no plant in that country. An old-established Portland cement manufactory in England has succeeded in locating deposits of the necessary raw materials lying in close proximity to each other in the neighborhood of Kroonstad in the Orange River Colony, on the main line of railway from Bloemfontein to Johannesburg, and it is intended to erect works there. The importance and value of manufacturing Portland cement in the South African colonies has long been known, but up to the present time the necessary raw materials for producing first-class Portland cement have not been found in proximity to each other or in suitable positions for cheap transit. A recent trade conference held at Bloemfontein, recognizing the importance to the colony of establishing the manufacture of Portland cement, recommended the Orange River Colony Government to offer a bounty to the first works established.

The contractors who were pushing the work on the big new mill being erected at Speeds, ten miles north of Jeffersonville, Ind., for the manufacture of Portland cement, are hopeful that the work will be completed so that the mill can be in operation by the beginning of October. The building will be fireproof, and will be constructed mainly of concrete. There are two rotary kilns, each 100 feet long, with a capacity of 800 barrels a day. The work on the new plant is giving employment to 100 men, and the total outlay represented by the mill is close to a quarter of a million dollars. For the past three or four years the natural hydraulic cement industry of Sellersburg and Clark county, Ind., has been under a cloud, the market for natural cement having been a constantly contracting one, while the production of Portland cement has enormously increased, and is still showing the same tendency. If Speeds make a success, it is possible that Belknaps will follow suit.

The cement companies in active operation in Michigan, with their daily capacity, are:

Ætna, Fenton, 1,000; Alpena, Alpena, 600; Bronson, Bronson, 1,000; Egyptian, Fenton, 1,000; Elk Rapids, Elk Rapids, 600; Farwell, Farwell, 600; Great Northern, Marlborough, 1,200; Newaygo, Newaygo, 1,300; Michigan Alkali, Wyandotte, 400; Omega, Scipio township, 500; Peninsular, Cement City, 700; Peerless Union City, 1,600; Toledo, Manchester, 1,000; Wolverine, Coldwater, 1,700; Wolverine, Quincy, 1,700.

The sale of the Hecla Cement Co.'s $1,000,000 plant has been postponed to June 28 by United States master in chancery Walter S. Harsha, at the request of the Detroit and Bay City syndicate which intends to bid in the plant.

The Wolverine Portland Cement Co. closed down for a week on account of breaking down of machinery during the first week in June.

The Elk Rapids Portland Cement Co. has started up after being closed for a year. The mill was ovehauled last winter at an expense of $50,000.

The Hitchcock Cement Plaster Works at Hitchcock, Okla., was destroyed by fire June 16, entailing a loss of $85,000, with only $18,000 insurance.

A Portland cement plant is being promoted by J. C. Roeper of Citrus Inyo county, California. The proposed location of the plant is six miles north of Citrus.

A transparent drawing board has been placed on the market by an English manufacturer. It consists of a one-fourth-inch plate glass sunk into a wooden frame. It can be lighted up from below by a tilting mirror, which reflects the light upward through the glass, thus making the tracing clear and distinct. It can likewise be illuminated by electric lights from below by this means the drawing board may be placed in the darkest portion of a room. The board has all the modern wrinkles such as tilting and means of fastening the tracing to the board.

Martin T. Roche, northwestern sales agent of the Alpena Portland Cement Co., has closed a contract with the Watab Rapids Power Company for 12,000 barrels of Alpena cement, to be used in the construction of their new dam and paper mill, located on the Mississippi river at the mouth of the Watab river, three miles north of Sauk Rapids, Minn.

The American Concrete Construction Company, with offices at 814 Mercantile Library building, Cincinnati, O., filed a deed of assignment on June 3 to Charles H. Urban. Assets are $2,500 and liabilities at $12,000. Inability to pay debts is given as the cause of the assignment. The deed of assignment is signed by C. H. Crawford as vice-president. C. H. Davies, who died recently in Boston, was president of the concern and the financial backer. His death caused the failure of the company.

The forthcoming Iowa state geological report will contain data showing that Iowa has rich deposits of cement materials in various parts of the state. The United States Geological Survey and Mr. Bain of the State Geological Department have worked together in investigating the cement resources of Iowa. An exhaustive report on the same subject is now being prepared by Professor Byers of the Ames State College. It will not be published for two years.

The Michigan cement mills are well sold up. While the recent cold weather has checked the demand to a certain extent, I understand there are but few mills that have any stocks on hand.

Pollock & Riedell of Rochester, Minn., will establish a hollow concrete building block factory at the above named place.

Henry Larson of Jamestown, N. Dak., manufacturing hollow concrete blocks, has sufficient orders on hand to keep his plant busy for the remainder of the season.

The State of Alabama has sold a tract of lime stone land at Ovens Bluff, 40 miles above Mobile, on the Alabama river, to C. S. Batchele of Salt Lake City, Utah, and D. J. McIntyre of St. Louis, Mo., who are promoting a Portland cement plant to be erected on the land.

Michael Dunn, convicted of bribery, says the Milwaukee Free Press, has invented a concrete steel fence post and has applied for a patent on his invention.

Two 12-story reinforced concrete buildings are to be constructed at Seattle, Wash., one for the American Savings Bank and the other for Judge Thomas Burke. Both buildings will be located on Madison street and Second. A. Warren Gould, architect.

Capt. Dan Brooks of Sturgis, Mich., has been appointed general manager of the Southern States Portland Cement Works.

A new Portland cement mill is to be erected at Speeds, New Sellersburg, Ind. Two hundred men are at work on this project.

F. C. Vincent, Ricksecker Building, Kansas City, Mo., has been elected secretary and treasurer of the Kansas City Portland Cement Co., which proposes to erect a plant in Missouri.

Joseph McCarty will manufacture concrete building block at South Kaukauna, Outagamie Co., Wis.

The Perrin Cement Machine Company, Columbus, Ohio., $10,000, was incorporated by Charles R. McIlvain, D. H. Towne, James H. Perrin, Colonel E. Bright and Fred C. Rector, to make machines for cement blocks.

Incorporated: Colorado Bridge & Concrete Company, $10,000. H. W. Harris, E. F. Baldwin, L. A. Richey, Pueblo, Colorado.

A cement building block company has been formed to manufacture at Neola, Ia. J. H. Cupp, Pres.

The Pelican Stone Co. of Fergus Falls, Minn., is manufacturing cement building blocks and cement brick.

The Pittsburg Construction Co. of Pittsburg, Pa., has received the contract for a concrete dam for the B. & O. Ry. to cost $150,000. The dam will be constructed at Griffin, 35 miles east of Pittsburg.

Standard Concrete Steel Co., Yonkers, N. Y.; object to manufacture fireproof construction; capital, $500,000; John F. Havemeyer, No. 262 West 78th street, New York; Harry L. McGee, Plainfield, N. J.; William B. Nisbet, No. 400 West End avenue, New York, incorporators.

Cement & Engineering News has removed to 226 La Salle Street.

THE BECKER SYSTEM OF REINFORCED CONCRETE COLUMNS.

We illustrate a new system of constructing Reinforced Concrete Columns known as the Becher system, which is designed to supersede steel columns. Under this system the columns are manufactured in advance in the factory, and after they are thoroughly cured and hardened they are transported to the building where they are to be used, and erected the same as steel columns.

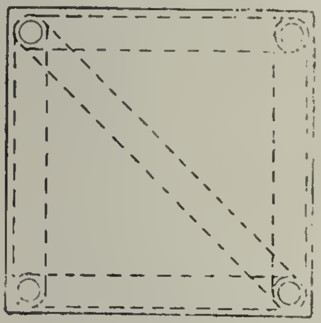

Fig. 1.

The inventor claims that by manufacturing the columns four weeks in advance they become properly cured and hardened and attain the sufficient strength to take care of the imposed loads, which is not true of Reinforced columns erected in place which are often subject to loads and stresses which may develop flaws and thereby weaken the column before it has developed sufficient strength to resist such loads. Where the column is manufactured in the factory and is thoroughly cured under the best possible conditions it will form a much more reliable product. The inventor says the factory columns is preferred by many of the Municipal Corporations of Germany, as it conforms more closely to the laws regulating the use of reinforced concrete in building constructions.

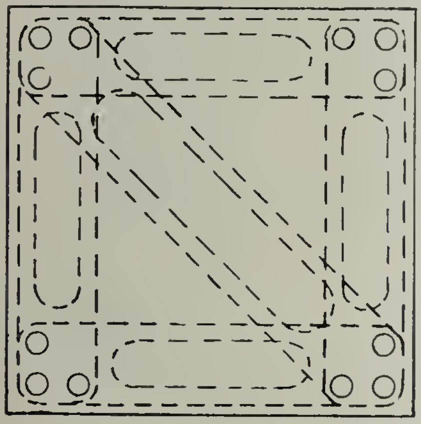

Fig. 2.

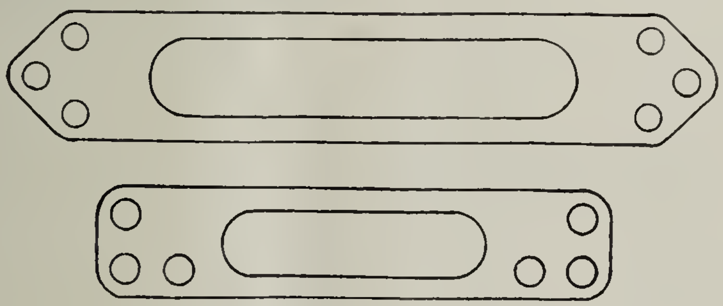

Fig. 3.

The column is composed of a skeleton frame with four or more round cell bars held together at regular intervals by four flat punched bars, shown in Fig. 1 for light columns and in Fig. 2 for heavy columns. The punched tie plates which are shown assembled in Fig. 2 are shown separate in Fig. 3. Fig. 4 shows the manner in which the bars and tie rods are placed in a column. The spacing of the tie plates, which is usually less than the diameter of the column, and the manner of superimposing one column on another.

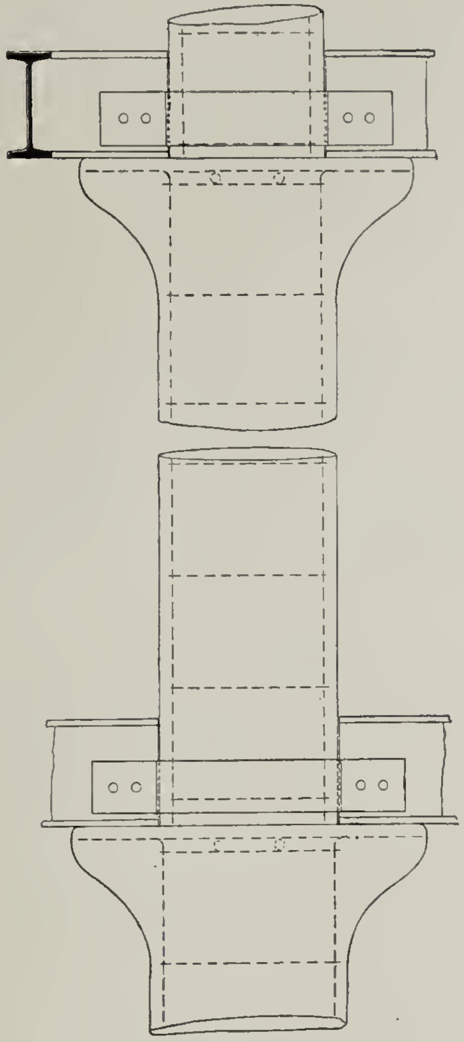

Fig. 4.

Fig. 5 shows the plan of reinforcing the bracket or consol at the top of the column.

Fig. 6 shows an ornamental 16-inch column in place with brackets overlapping 6 inches on either side. Carrying the floor above.

The comparative test of two Becher reinforced concrete columns, each 16 inches in diameter, 256 sq. inches cross-section, one column being tamped, the other cast, each having the same identical reinforcement and mixture of concrete. The cast column began to show cracks under a load of 490,600 pounds. The tamped column began to show cracks under a load of 921,800 pounds. These tests were made at the Charlottenburg Mechanical Technical Testing Laboratory, near Berlin, Germany.

Mr. Becher, says "that experience shows that about one-half the cost of labor is saved in constructing these columns in a well equipped factory and sending them finished to the building where they are to be used, over columns manufactured in place in the building, as is now the general practice. Besides the factory made columns will be more reliable in every way than columns built in place.

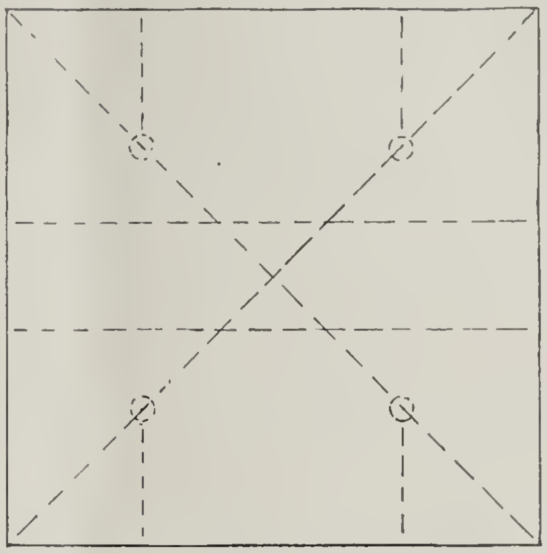

Fig. 5.

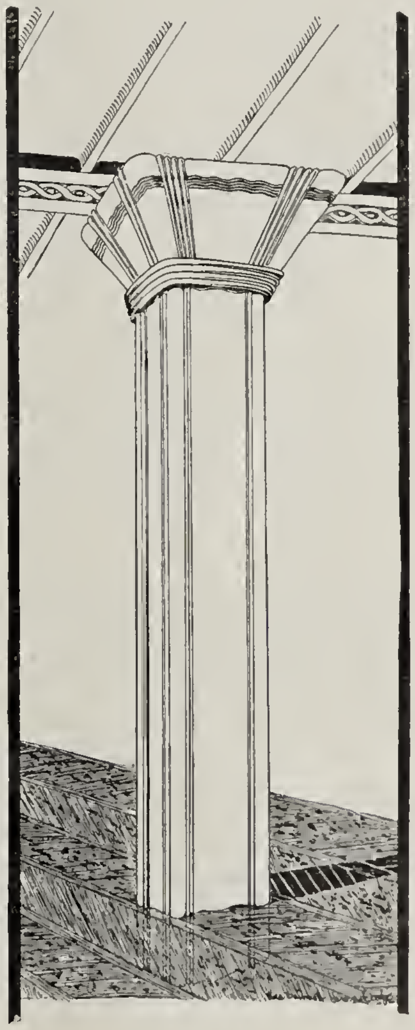

Fig. 6.

American Patent No. 731,743 covers the invention. M. Czarnikow & Co., Berlin W. 9, Werderscher, Markt Nr. 9, Germany, are the general agents for the Becher column for the United States and other countries.

INCORPORATIONS.

Climax Cement Block Company of Rock Rapids, Iowa; capital, $7,500; S. S. Wold and others incorporators.

The Consolidated Concrete Block & Construction Co., No. 319 Market street, Camden, N. J.; object to manufacture concrete blocks and machines; capital $250,000. Incorporators: George N. Torrance and Alfred Kayne, both of Washington, D. C.; J. H. Danenhourn, Bethayres, Pa.; George C. Weston, No. 118 Chestnut street, Philadelphia.

The Cuyahoga Concrete Stone Company, Cleveland, O.; capital, $100,000; Frank H. Anderson, George G. Sowden, K. F. Gill, Frank C. Caine and Brewster P. Kinney, incorporators.

McClanahan Concrete Company, Fort Branch, Ind.; capital, $5,000; Fred C. McClanahan, Walter C. Polk, Homer T. Genung incorporators.

Middlesex Hollow Concrete Building Block Co., New Brunswick, N. J.; object to manufacture concrete building blocks; capital, $25,000; Conrad W. Kuhlthau, John H. Kuhlthau of Millton, N. J.; John S. Dahmer, New Brunswick, N. J., incorporators.

Cement Ventilating Stone Co., 335 W. Rich st., Columbus, O.; capital, $10,000; object to manufacture cement blocks; H. D. Mooar, president, and O. S. Markworth, secretary and general manager, incorporators.

Bluffs' Stone Co., Bluffs, Ill.; capital, $5,000; object to manufacture cement and concrete blocks, construction and foundation work of all kinds.

Atlas Cement Machinery Co., Rochester, N. Y.; capital, $10,000; object to manufacture machinery; Charles L. Aird, Jacksonville, Mich.; Charles E. Shore, A. T. Bradley, Alfred J. Shore, Rochester, N. Y., incorporators.

The Fort Smith Hollow Stone Concrete Company, Fort Smith, Ark.; capital, $10,000; Joe Bertino, G. W. Harper and J. B. Smedley incorporators.

New Era Cement Roofing Company, Nashville, Tenn.; capital, $10,000.

The National Cement Pressed Brick Company, St. Bernard, Ohio; capital, $100,000; J. W. Smith, J. C. Smith, Stanley Smith, F. E. Stevenson, and G. A. Anderson incorporators.

The Michigan Manufacturing & Mercantile Co., Grass Lake, Mich.; capital, $10,000; object to manufacture Portland Cement, Brick, etc.; Lamont C. Bidwell, Frank A. Vernor and Isaac N. Payne, trustee, of Detroit, and Edward J. Foster of Grass Lake, incorporators.

Capital City Concrete Construction Company, Springfield, Ill.; capital, $40,000; P. E. Taintor, L. E. Lawson, E. S. Smith, incorporators.

The Horton Concrete Company, Iola, Kansas; capital, $10,000.

Ashtabula Concrete Co., Ashtabula, O.; capital, $25,000; object to manufacture concrete stone and brick.

Lytle Block Co., Sioux City, Iowa; capital, $100,000; C. F. Lytle, Wm. Gordon and R. M. Dolt, incorporators.

Palmer Lime & Cement Co., Huntington, N. Y.; capital, $25,000; object to manufacture cement and building material, deal in sand, stone, etc.; Lowell M. Palmer, No. 206 Clinton avenue, Brooklyn; Lowell M. Palmer, Jr., No. 49 South Portland avenue, Brooklyn; Lucius M. Koons, No. 40 Sanford avenue, Plainfield, N. J.; Henry M. Brigham, Egbert V. Nelson, No. 37 Liberty street, New York, incorporators.

Acme Burial Vault Co., Indianapolis, Ind.; object to manufacture cement burial vaults, etc.; capital, $10,000.

Shamokin Cement Building Block Company, Shamokin, Pa.; capital, $15,000.

The Western Cement Block Building Company, Logan, Utah; capital, $10,000; H. T. Cornwall, president; Robert Murdock, vice president; G. F. Thatcher, secretary and treasurer, incorporators.

A company is being organized to build a concrete dam on Sugar creek twenty miles north of Terre Haute, Ind., to generate from 1,800 to 2,000-horse power. The dam will be constructed at a point on the creek where the sandstone bluffs are 45 feet high on one side and 75 feet high on the other. The cost of the dam and power house it is estimated will cost from $200,000 to $300,000. The cliffs on both sides of the creek for a distance of 3 miles or more back of the proposed dam are over 100 feet high. It is proposed to sell the power to the Consolidated Union Traction Co. of Wabash and other consumers of power. The project is in the hands of Kokomo and Frankfort, Indiana, capitalists, who have options on overflow bottom lands. Condemnation proceedings have been commenced to secure other back water lands that will be flooded by the proposed dam.

The Practical Cement Block Co., Indianapolis, Ind.; object, to manufacture cement building blocks, etc.; capital, $20,000.

V. B. Concrete Company, Terre Haute, Ind.; capital, $5,000. Directors: J. E. Voorhees, D. B. Bolinger and Everest Voorhees.

The Ryan Concrete Company of Waterville, Ohio; capital, $30,000. Incorporators: Charles W. Ryan, R. C. Roach, Charles H. Webster, Charles Hartman and Daisy D. Cambrick.

The Marysville Lumber, Cement, Block and Shingle Company, Marysville, Ohio; capital, $50,000. Incorporators: A. E. Plate, J. M. Broderick, C. J. Jones, D. H. Frey and C. S. Hamilton.

The McArthur Clay and Cement Block Manufacturing Company, McArthur, Ohio; capital, $50,000. Incorporators: Frank E. Mohr, Jack Thomson, J. M. Moore, Charles B. Westcott and John N. Best.

The National Concrete Company, Indianapolis, Ind.; capital, $100,000. Directors: E. H. Lee, R. F. McFall and others.

The new Bridgeport Concrete Co., St. Clairsville, Ohio; capital, $10,000. Incorporators: Senator Heinlein, Judge Driggs and others.

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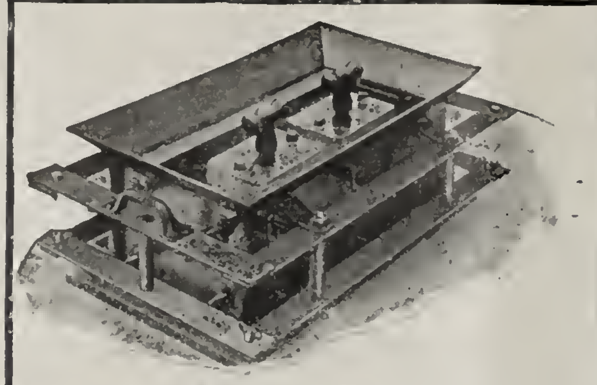

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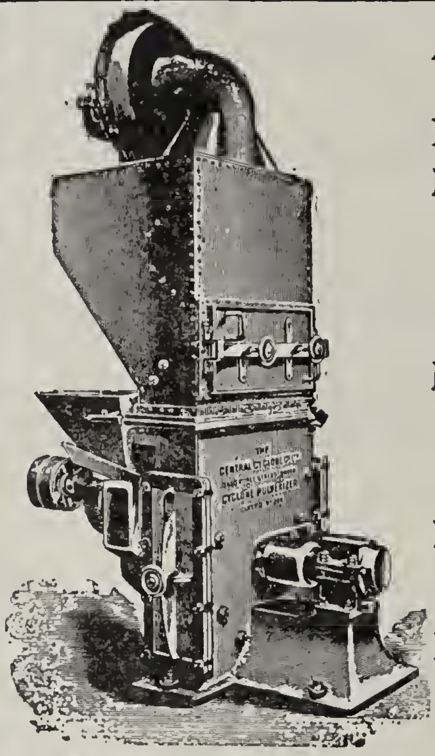

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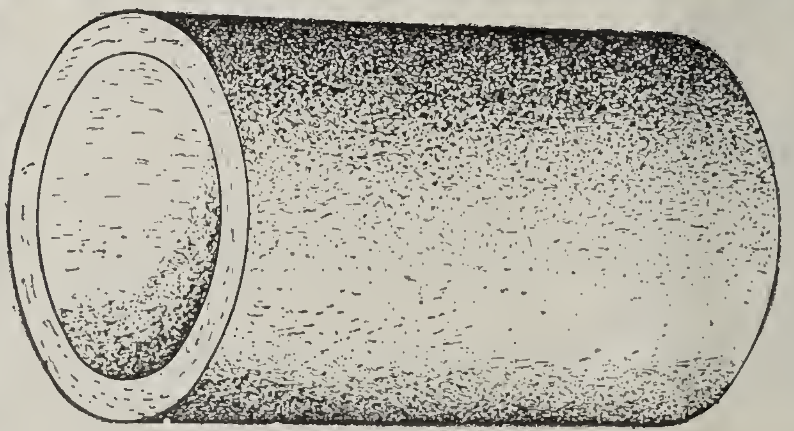

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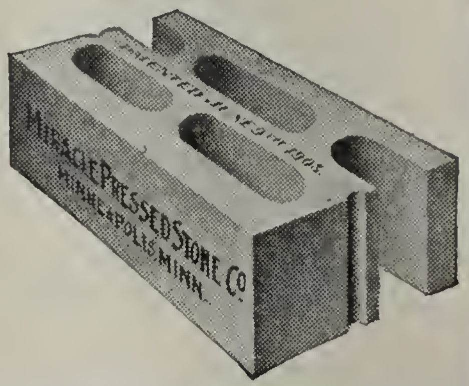

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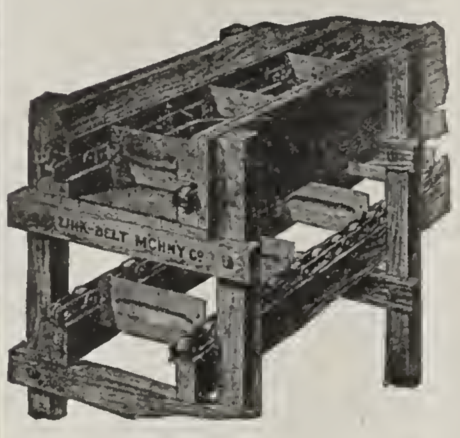

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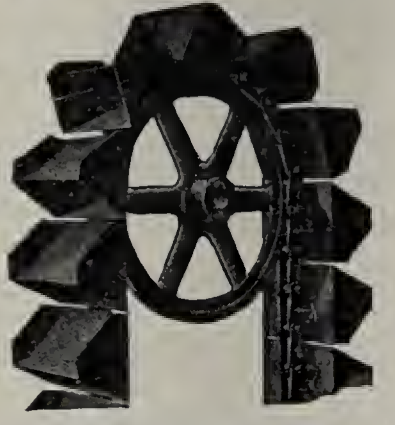

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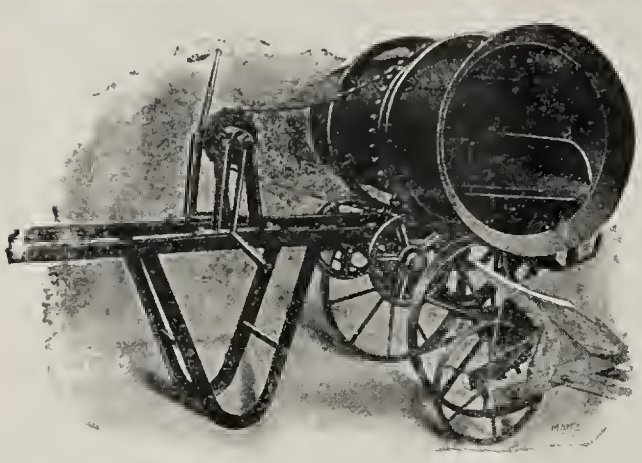

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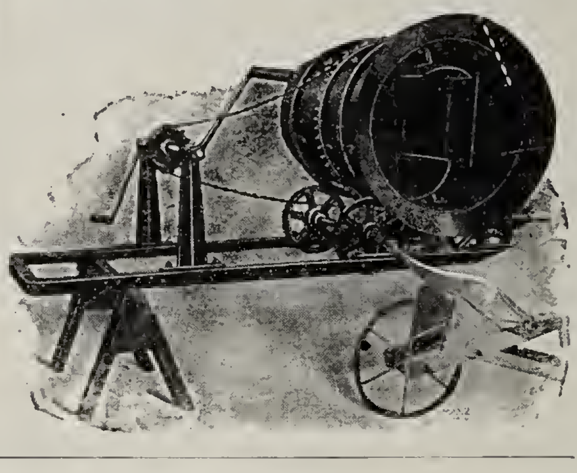

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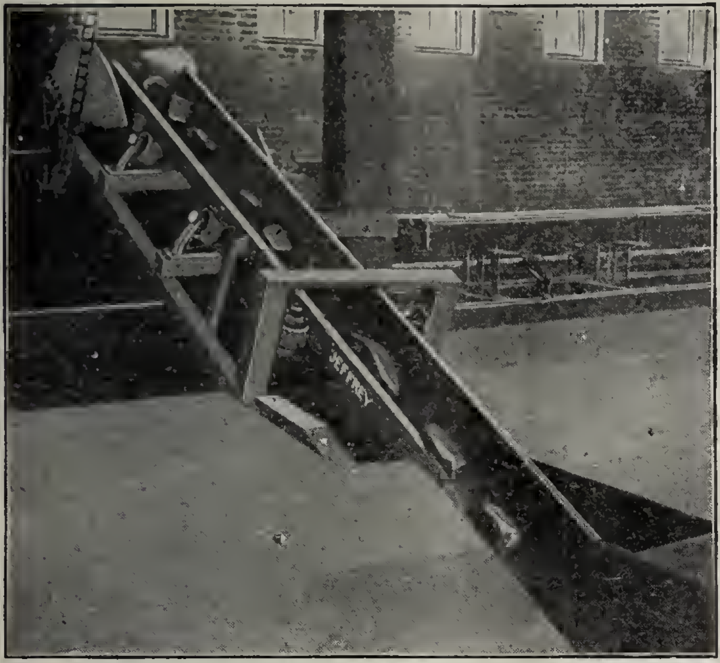

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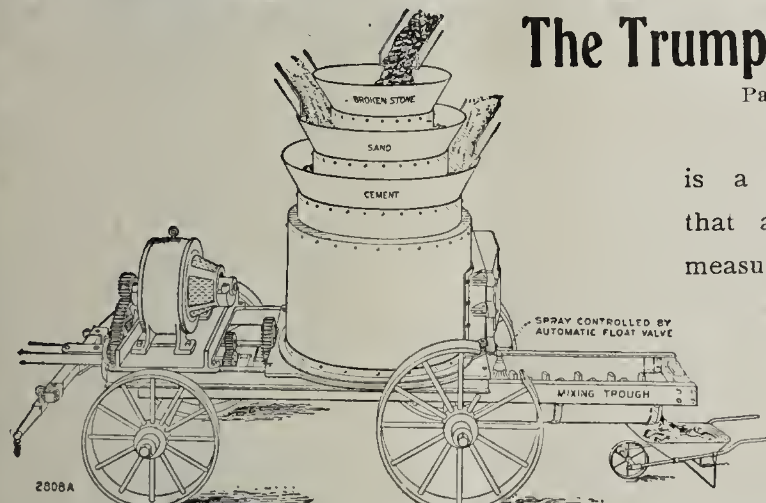

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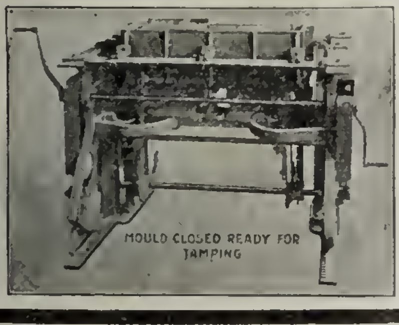

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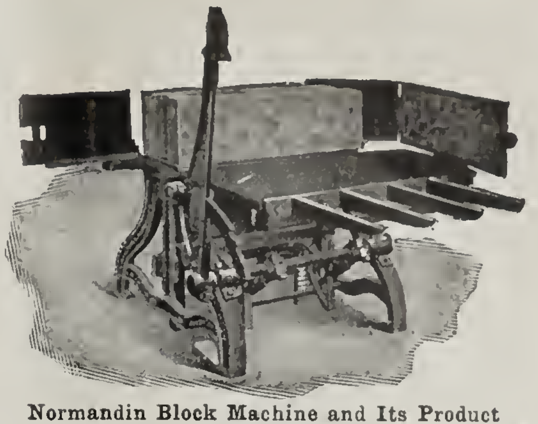

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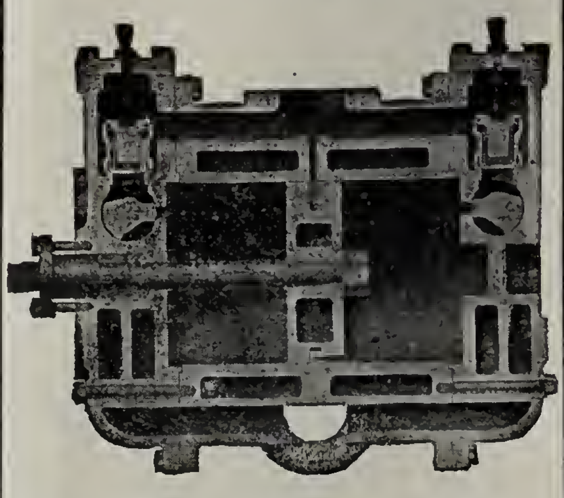

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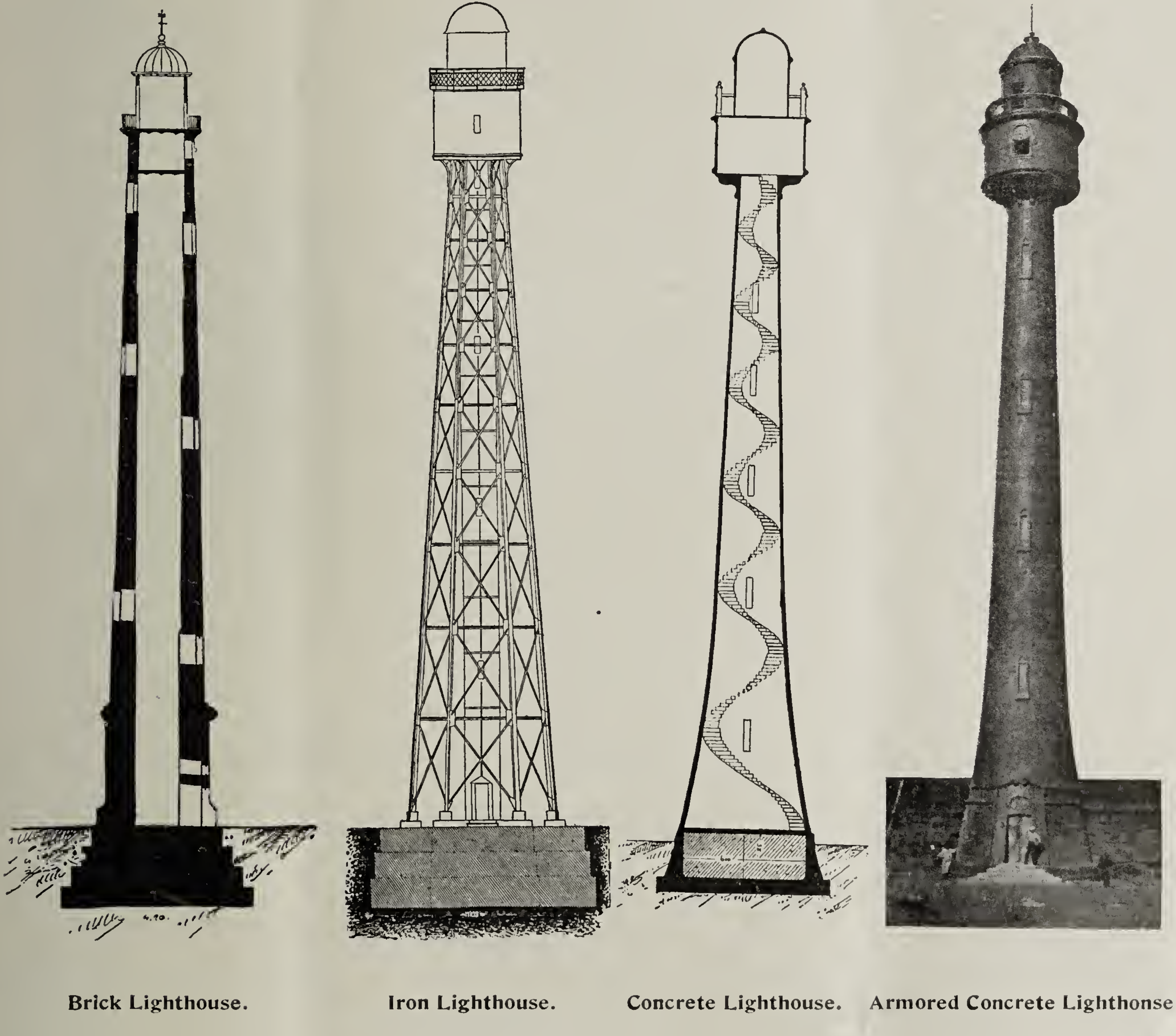

Brick Lighthouse. Iron Lighthouse. Concrete Lighthouse. Armored Concrete Lighthouse.

A COMPARISON OF THE CONSTRUCTION OF SEVERAL TYPES OF LIGHTHOUSES.

See page 136 for description.

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We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

LABOR STRIKES IN CHICAGO.

The great teamsters' strike which has been in force for over three months is about to collapse after subjecting the city to great financial loss estimated at not less than $15,000,000 to private business interests alone, while the 5,000 teamsters who received $2.50 per day which distributed over 100 working days lost $1,250,000 in wages. The 25,000 members of the brotherhood of the Teamsters' Union throughout the country were assessed $350,000 to maintain this strike. After the funds of the Chicago teamsters' local unions had exhausted their own funds, which amounted to about $100,000, other trade unions in sympathy with the strike contributed possibly $75,000. The regular strike benefits paid to each striking teamster was $7.00 per week, or about $525,000. The allotted strike benefits were at times from two to three weeks in arrears, for a portion of the strikers, causing great hardship and suffering to the strikers' families. As soon as the strike was declared the streets became unsafe for team traffic, for weeks mobs attacked non-union drivers. Men were killed and maimed and blood was shed daily, demonstrating that criminal instincts ruled as in the councils of the strikers' propaganda.

The great mercantile houses, wholesale and retail, together with manufacturing establishments, obtained a charter for a teaming company with over $1,000,000 capital in order to carry on their business and applied and obtained injunctions in the U. S. courts restraining the strikers from interfering with its business. Deputy U. S. marshals rode on its wagons fully armed with rifles and revolvers. The express companies paid their non-union drivers $9.00 per day for over nine weeks in order to carry on their business. The police force of Chicago were ordered to ride with conveyances not protected by the U. S. courts. The city paid for each policeman's dinner on this duty, for their meals the city paid out $150,000. Numerous indictments have been found against labor leaders. The unions placed numerous wrecking crews at work in the city whose duty it was to maim and injure non-union workers at so much per head, regular appropriations being made for this purpose. One of these wrecking crews composed of eight members entered bricklayers' hall, the headquarters of the unions, where a ballot was being taken to end the strike, they assaulted the officer in charge, destroyed the ballots and left. Now the rank and file of union, with few exceptions, refuse under fear of being assaulted to disclose the identity of this particular wrecking crew.

The labor unions rely upon force to terrify non-union labor as a strike weapon. This practice should be suppressed by a rigid enforcement of the law. Force is one of the weapons of anarchy, and its use by trade unions may be directly traced to the influence of the anarchists, as follows some 20 years or more ago. The radical section of the Russian anarchists met in Europe to revive anarchy, which was then at its lowest ebb. At this meeting it was resolved to spread the anarchists' propaganda of force and disrespect for law among the working classes and especially the trade unions of the world, otherwise anarchy would become extinct, and in furtherance of this aim the anarchists' agents have crept in labor unions the world over. It is only fair to say that wherever these anarchists have been known to labor unions they have been expelled as a dangerous element not wanted by the majority of the members. Yet some of the officials seem to rely upon force and distribute funds from the union coffers to the wrecking crews. The state of Colorado has enacted a law which prohibits boycotting or intimidation of any kind against merchants and manufacturers and workmen under severe penalties, either by fine or imprisonment or both. Similar laws should be enacted in every state in the Union and thus set bonds and limitations to the scope of strikes.

After the strike has been called off now come the cement and crushed stone teamsters and demand that all teamsters in the city be called out because of a condition enforced by the employers that no union button shall be displayed by union teamsters on duty.

This will involve the calling out of 30,000 men in the city and would arrest all transit of goods and merchandise in the streets of Chicago and stop all building enterprises now under way, and affect 150,000 men who would be thrown out of employment.

ARTIFICIAL MARBLE.

A recent German patent covering the production of artificial marble. Invented by Johannes Finzen of Suderbrasup, Schlesvig, Germany. The process is as follows: On a bed of plate glass a thin Portland cement mortar is poured and spread out to the thickness of ⅛ inch, and permitted to harden so the sheet may be broken or cracked by the use of a chisel into irregular pieces to resemble veins, and slightly separated. A very thin colored cement mortar is next poured over the sheet, care being taken to fill all of the spaces. The work is next backed up with a coarser cement mortar and slightly tamped and permitted to harden. When the slab is removed and polished, the face of the slab will then show a beautiful net-work of veins in exact imitation of natural marble. For inside work Plaster of Paris can be used instead of Portland cement. Several colors can be worked into the veins. by again breaking the sheet after the first set of veins have been poured and set. Colored marble can be produced by mixing the cement used for the original facing with any color desired, and breaking as above described and filling the spaces with any suitable color, whereby any desired combination of body and veins may be obtained. To produce white marble with colored veins, marble dust mixed with the cement heightens the effect and produces a good imitation of light colored veined marble. Granite and other colored stone can be closely imitated.

INDUSTRIAL ACCIDENTS IN FRANCE

The total number of employes injured in French industries from July 1, 1899, to December 31, 1903, was 44,163, of which number 6,962 died. These accidents, classified by trades are as follows: Metal trades, 9,693; public works and building trades, 7,673; transportation and freight handling, 7,635; mines, 4,992; textile industries, 2,833; food industries, 2,509; stone cutting, brick workmen, etc., 1,225; paper and rubber works, 1,101; agriculture, 737; hide and leather, 583.

The Edison Portland Cement has increased its capital stock from $11,000,000 to $12,000,000. W. H. Shelmerdine, president, and Thos. J. Crane, secretary of the company.

A concrete block factory has been organized at Woodward, Oklahoma.

CONCRETE BUILDING BLOCKS FOR U. S. GOVERNMENT.

The United States government has adopted the concrete building block for its buildings in our colonial possessions, especially in the Panama canal zone and in the Philippine islands. These buildings will be used for hospitals, storehouses and barracks for officers and men of the United States army, as well as for civilians engaged in the construction of the Panama canal; while in the Philippines troops and their officers will be housed in concrete block houses, which will also be used for depots and stations for the new and extensive railway system which the government is to construct, and for shops, round-houses, freight-houses and such other buildings as may be required for railway purposes. It is a well known fact that wooden buildings do not endure in tropical climates unless the wood is carefully selected, in Brazil even Lignum Vitae, which remains perfectly sound in our own country, crumbles to a powder in a few years after the tree has fallen in its native forest.

Before adopting concrete block construction the United States engineer corps subjected the concrete building system to thorough and rigid tests, which were all satisfactory. The government engineers gave their unqualified endorsement to machine-made, concrete building blocks. This endorsement is a complete answer to a cry of rival interests that the concrete block is not suitable for building construction. The government finds they are, and there is no higher authority than this endorsement. That class of busy bodies who waste time in crying down concrete building blocks as a pastime, are up against facts, up against the United States engineering corps' endorsement of concrete building block constructions, of concrete as a suitable building material.

Mr. H. S. Palmer of the Palmer Hollow Concrete Building Block Co., was instrumental in having the government adopt concrete construction for buildings in our insular possessions. In the canal zone, Isthmus of Panama and the Philippine islands, Mr. Palmer has his own men to superintend the manufacture of the blocks, Mr. J. D. Wood, formerly of Wheeling, W. Va., being General Superintendent of Construction at Panama and in charge of the factory.

The United States government erected several concrete building block houses in Cuba while in military control of the island following the Spanish war. The government cold storage and artificial ice plant at Manila, P. I., is constructed of concrete throughout.

STRAW ROADS.

In California dirt roads become very dusty during the dry season, making vehicle traffic over them trying the extreme. The dust fills the eyes, hair and destroys the clothes of persons riding over them during this season. Horses become entirely covered with the dust, which man and beast inhale. Vehicles travel in a cloud of dust. This is practically true of the dirt roads in the Sacramento Valley. The farmers in this region have resorted to covering these bad roads with wheat straw or stubble, which is left standing by the harvesting machines after the heads have been cut off. This stubble is cut, loaded onto wagons, while another party of farmers level and grade the road to the proper shape; after which, 6 to 8 inches of straw is placed upon the road the full width of the wheel tracks or about eight feet wide. From 16 to 20 loads will cover a mile of roadway. It is now proposed to cover the roads in June before they have been ground into dust; this, to be followed by another dressing in August. This method would almost entirely prevent the formation of dust. Where only one application is practicable, a single dressing in August works wonders. After the straw is deposited and wheel traffic begins, the dust works up through the straw, just sufficiently to hold it down, and prevents fires from spreading, while the dust underneath becomes hard and firm, thus a good road is produced at a very low cost.

In the state of Washington, where straw roads have been introduced by Mr. Chas. L. Whitney of Walla Walla, Wash., after considerable missionary work 100 loads of straw and $20.00 cash was raised, 100 men in different localities were appointed to act as captains who assembled the workers in Walla Walla county on August 20th, 1901, "Straw Day." More than 30 miles of road were completed in one day. The merchants of Walla Walla donated various kinds of prizes to be given to persons who pitched the most straw, made the best piece of road or hauled the largest load. On September 1st, 1902, a grand barbecue was arranged for Straw Day; 10,000 people assembled and assisted in the work of road-making.

A good straw road, annually renewed, is said to give better satisfaction than macadam not kept in suitable repair. Straw road-making has been taken up in Idaho on similar lines, as well as in other Western states. Straw road dressing is practiced to some extent on bad sand roads in Michigan with good results.

WASHINGTON PORTLAND CEMENT COMPANY.

Work on the plant of the Washington Portland Cement Co., to be established at Baker City, Skagit county, Washington, has been commenced and it is expected that by the first of next year the factory will be in full operation, says the Seattle Post Intelligencer. Local capitalists have secured the co-operation of eastern men. All the details of the organization have been completed. The plant will be operated by electricity generated by water power. The work of constructing a flume 4,000 feet long from the Skagit River is well under way. The machinery for the plant has been contracted for in the east. The completed plant will represent an expenditure of about $400,000. The company will establish an office and warehouse in Seattle, from which point the entire output will be handled. The officers of the company are: H. N. Anderson, president; A. S. Austin, vice president; S. M. Anderson, treasurer; E. E. Caine, secretary; E. C. Miller, general manager.

The Climax Cement Block Co., of Rock Rapids, Iowa, has secured a site for a factory.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	MAY				ELEVEN MONTHS ENDING MAY			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs	Value in Dollars
United Kingdom.	270,800	$1,117	....	....	44,179,848	$140.878	6.997.424	$22.910
Belgium	5,598.460	14,493	9,924,649	$28,066	177,425.886	532.583	149.526,701	482.929
France	521.886	2,283	1,190.600	4,083	110,941,578	37,822	7.454,199	28,366
Germany..........	23,126,944	80,820	6,148,543	20,354	350,013,962	1,193,064	183,226,141	619,635
All Other Europe.	388	1	....	....	5.321,740	14,591	1,227,501	4,224
British North Am.	42.000	206	62,600	356	932.515	4,368	215,215	1,405
Other Countries..	403,156	1,571	245,060	930	366,298	14,846	2,116.324	8,096
TOTAL	29,963,628	100,941	17,581,452	53,789	592,483,827	1,938,152	350,763,805	1,167,565
Domestic Exports of Cement, bbls.	55.385	72,166	113.812	148,977	304,701	404,640	957,570	1,338,237

There were 11,679,000 lbs. of imported Roman and Portland cements, etc., in the United States bonded warehouses in May, 1904, valued at $36,886, against 10.697.148 lbs. in May, 1905, valued at $34,474.

For 11 months ending in May, 1904, there were 143,588 tons of asphalten imported in the United States, valued at $473,444 against 110,009 tons imported in 11 months ending May, 1905, valued at $1,096,997.

COLORING OF CONCRETE BLOCKS

By J. P. Sherer, Milwaukee, Wisconsin.

Mr. President, Gentlemen of this convention: I don't know why Mr. Wiltse did not inform me sooner that I was expected to give you my ideas with reference to this subject of coloring of cement blocks and I did not prepare any paper. I have read some papers on this matter formerly but in addition to that I have been making some experiments that perhaps might interest you, and I will be very brief because I understand many of these gentlemen want to get away soon.

To go over my informal statements in a verbal way I will say that we experimented with many pounds of coloring, both in this country and in Europe. We found some of these desirable. Others were detrimental inasmuch as they contained acidulous or greasy matter, which was a detriment to the cement. The most desirable we found to be the iron pigments or oxides of iron, different kinds, yellow, buff, and gray more particularly, and in my experience as a block manufacturer I found that red color was more desired by our customers than any other. Consequently we made more of that color. The method and manner in which we mixed this was by mixing our color first, arriving by experimenting at exactly how much color by weight we would require for a certain amount of cement or cubic inches of cement. This was done by making briquets and allowing them to dry. Many of the oxides are not very strong in coloring matter, and I will add here that your customers many times think they desire a stronger color than they really should have, because in my latter experiments I found the more delicately colored stone to be more desirable, speaking from the standard of commercial product.

Of course, you all understand that adding color to your block will increase the price, and many people do not care to pay the advanced price that they may have to in order to get this colored product. After finding out exactly how much color you want, as I said before, the action of the free lime in the cement kills the color to a certain extent, and until your product is thorough dried out you never know exactly how much color is necessary. It must be dried out to find out exactly what effect the coloring has had on your material or is desired when you have this amount it is essentially necessary that it be thoroughly mixed in so that your produce may be uniform in color and not streaked or spotted. My practice has been to mix this color or pigment with cement, mixing it thoroughly. In addition to this, I use the dryest possible aggregates that I can find. If I am using sand it must be thoroughly dried.

A Voice: Kiln dried?

Mr. Sherer: If possible. As I say, it is necessary to have it dry because the dryer it is you will find that the color and your cement mixed with your sand carefully gives you so much better results. In addition to this, I find it very necessary to be careful in applying the moisture to this already mixed sand, color and cement. It is a habit of many of our concerns in mixing—we are in a hurry, we want to make a certain amount of material, have our men produce a certain number of feet per day—but we administer that water too broadly, in too large quantities. I have found it desirable to spray it on in as light a form as possible so that the action of the water when coming in contact with your aggregates does not wash the color from the cement and sand or your materials.

Of course, in using color, I find it it essentially necessary that we use more care in mixing than we would in making our ordinary stock. When in Indianapolis I stated that I had been requested by an architect to make a green stone. We find that green color in almost all cases contains acidulous matter, and while I have made some specimens and have been adding from those from time to time making the body of the stone an olive green, adding a livelier green color through it as streaks to imitate a certain stone, I find that this stone at present shows no sign of disintegration or of giving away of any kind. But I have learned one thing in my experience in concrete, that it sometimes requires a long time test to find out exactly what your aggregates and your combination will do when exposed to atmospheric influence for a period of several years, and consequently I do not form these conclusions hastily. But I have recently been making experiments with more delicate tints of these coloring matters and I would suggest that if you have any call for colored product, instead of allowing your customers to suggest what they want, that you make them some samples of various colors, using but little coloring matter, getting a delicate shade of different colored stones in which there is no possibility of the pigments or water compound you use being of much detriment to the cement, and you will invariably find your customers selecting one of the different kinds of delicate colors, I think, in preference to the more ultra color. I am speaking now from the standpoint of the cement block maker and not particularly as a machinery man. It has been my experience for years. There isn't much to be said about it other than it has been my experience of late that we have not been asked to make a colored stone nearly as much in recent years as we did when we first started in the business. It seems to be the general idea that they would prefer the natural color product, that being a stone which requires but little coloring to imitate. I do not mean that we imitate certain stones, but they are cement stones themselves. They have a certain individuality so that it is not necessary to imitate anything.

I will not detain you with any elaborate discourse on this subject because it is a very simple proposition. I will only say that the amount of coloring we use is governed largely by the coloring matter that the compound contains in itself. At that you can not arrive, nor could I give you any formula, because the character of your aggregates and the strength of the coloring matter would depend entirely on themselves. I might say to you that I mix a certain amount of coloring matter with my aggregates to get a certain result, when in another locality you would have something to overcome in your aggregates which is not in mine. So I say the only way you can arrive at any definite conclusion of what you want is by experiment. It is easily done, only making small briquets, allowing them to dry out as the mason would do with his mortar to make colored joints in his work. He makes a small quantity, allowing it to dry out. And I will add here, many people think this product fades. That has not been my experience. It grows lighter up to the time it is thoroughly dried out, then if anything it grows darker with age. I have one house in which I have used those colored products perhaps eight or nine years ago, and it as I say grew light until such time as that it had become thoroughly set and dried out, and it has grown darker ever since with smoke and the other elements in their effect on the material.

Mr. Seafert: Do you use hand mixing or do you have a machine?

Mr. Sherer: Well, we use mixers. We have three Smith mixers in our factory. We mix our cement and color together before we place it in our mixer. Then we place it in the mixer at times when we are in a hurry. Otherwise we mix it all by hand and spray this mixture as lightly as possible. One thing we all see is this, many of the mixers, in them you have left perhaps a taint of coloring, and it will follow in something else you may mix after, so that it is not always advisable to use it afterwards unless you have a separate mixer. Those things are being taken care of, I believe, in a more recent style of mixer, in which the aggregates are mixed dry. So far, speaking about mixers, I am not thoroughly satisfied with the mixers we have at present for block purposes.

While many of them are good for wet concrete or other products, yet for some dry mix or quite dry mix I don't know as I have seen one that satisfies me perfectly. So that to get nice results we should mix by hand unless we have a separate mixer we could use.

Mr. P. O. Krottnaurer: I would like to ask Mr. Sherer what experience he has had with white or nearly white color.

Mr. Sherer: I will say to the gentleman that I have not been using any white colors, anything except marble dust, ground white quartz, and I have very recently made a colored stone and I did it in this manner. I have some friends who are engaged in the sand lime brick business and I was anxious to visit them and see what effect their induration and high pressure would have on a cement block. Incidentally, we made some blocks of the mixture of 8 per cent hydrated lime in addition to our 10 per cent of cement used in our block, placing it in the indurating tunnel for eight or ten hours, I have forgotten just which, and the result is that I have in my office those stones, and they are very white and nice, it looks as though the lime permeated in a measure. However, it makes a very mild light colored stone, and the stone has never had any water since it was made, four or five weeks ago, and it is very hard and seems to be hardening up a good deal after the manner of sand lime brick.

A Voice: May I ask you if any analysis has been made of the lime?

Mr. Sherer: Yes, I believe so. I have only the statement of the manufacturers, and they claim the lime contained carbonate about 98 per cent, with about 2 per cent of magnesia and with a small percentage of salts of some character.

A Voice: Where was that work, was it over in Michigan?

Mr. Sherer: It was over in Holland, Michigan. But I have done it in Minnesota. That was Petoskey lime. And I believe that limes vary much. I believe that cement block makers in many places do not understand the difference in lime. For instance, there is a lime that contains anywhere from 20 to 42 per cent of magnesia. It ought not to be associated with cement in any way. I do know that these limes that contain magnesia are detrimental to the cement product. That has been my experience.

The Link Belt Engineering Company of Philadelphia, Pa., has published and is circulating a handsome booklet which tersely explains the advantage of the celebrated Renold Roller Chain. Copies can be had on request at the above address.

CONCRETE BLOCK MACHINE MANUFACTURING ASSOCIATION.

The above named association was organized at the Great Northern Hotel, Chicago, June 27, '05. There was a large attendance of manufacturers and others. Papers were read by O. U. Miracle of Minneapolis; M. Wetstein, South Bend, Ind.; N. B. Marple, Columbus, Ohio; Frank Dykman, Grand Rapids, Mich.; N. F. Palmer, New York; Levi P. Normandin, Jackson, Mich.; J. F. Angel, Columbus, Ohio; Sid L. Wiltse, Jackson, Mich.; L. Pettyjohn, Terra Haute, Ind.; E. T. Cairns, Chicago; J. P. Sherrer, Milwaukee, Wis.; J. W. Sanderson, Burlington, Ia.; P. B. Miles, Jackson, Mich., and L. Broughton, Cleveland, Ohio.

J. F. Angel, of Columbus, O.
President of the Concrete Block Machine Manufacturers' Association.

C. C. Huston, of Columbus, O.
Treasurer of the Concrete Block Machine Manufacturers' Association.

A banquet on the evening of June 27th was given at which more than seventy guests were present.

Sid. L. Wiltse, of Jackson, Mich.
Secretary Concrete Block Machine Manufacturers' Association.

Membership fee was fixed at $25.00 with one membership limited to each concrete block machine manufacturing concern.

Several of the papers read appear in this issue.

CEMENT BLOCKS IN IOWA.

One of the features that is sure to strike the attention of the traveler in the Iowa of to-day is the phenomenal rise of the cement industry. Almost every town is coming to have its cement block factory. As the supply of lumber is diminishing, and in many of our prairie towns stone must be transported over long distances, these blocks serve as a welcome substitute in many kinds of building operations. Nearly every community has a convenient sand pit, which furnishes all the local raw material required. These blocks are unexcelled for bridge piers, foundations, and retaining walls; and when they are made frost and moisture proof, they can be utilized to great advantage in the walls of substantial houses.

It is reported that the Atlas Portland Cement Co. will erect a new plant on its holdings between the Alpha and Vulcanite Portland Cement Works. Engineers on the tract for some time.

WHITE PORTLAND CEMENT.

By Richard K. Meade, Nazareth, Pa.

With the remarkable growth of the artificial stone and hollow concrete block industries, it is natural that there should come also a demand for white hydraulic cement, preferably a white Portland cement. Such a cement is badly needed by the manufacturers of artificial stone, and I notice frequent inquiries in the question boxes of our leading technical journals as to where such cement can be obtained. Those engaged in making such ornamental pieces of concrete as fountains, terrace steps, pillars, columns, capitals, cornices, etc., are all of them on the lookout for a material which will let them imitate marble, white sandstone, etc. There has also been a demand for some time past for a non-staining cement for use in laying granite, marble, Indiana limestone and light colored natural stones in general. This latter demand has been met in part by certain puzolan cements imported from France and Germany. These cements are not white, however, but do not stain. They do not, of course, have the strength of Portland cement, but are much used, simply because they are non-staining, while all brands of Portland cement will stain light colored stones. The advent of a white Portland cement would probably in time cause the retirement of these cements from the market, not only because of the greater strength which it would possess, but also because the cement itself would be colorless and joints between the separate pieces of marble would not show.

A white Portland cement would not only be useful for the manufacturers of artificial stone, but also for a great variety of interior and exterior work. For instance, walls and ceilings could be made of it instead of plaster. These walls could be washed clean when soiled. They could be streaked to represent marble or onyx or delicately tinted. In hotel lobbies, theatres, waiting rooms, etc., floors could be laid in this cement, adding in many cases greatly to the appearance. Ornamental tiles in delicate shades of blue, pink and green could also be made for floors, etc. In connection with metal lath (as a reinforcement), flower pots, fountains, bath tubs, etc could be constructed. Since it adheres perfectly to ordinary Portland cement, because the former is only the latter with the iron left out of its chemical composition, concrete made with ordinary cement could be used for the hidden parts of the structure and the white Portland cement for a finish. A white Portland cement could be mixed with water and used for a whitewash, or ground into oil and used for a paint.

The number of uses to which a white Portland cement could be put are unlimited, and upon its introduction on the market energetic manufacturers and architects would find many ways of employing it to advantage; just as ordinary Portland cement has gone far beyond the bounds of the narrow field originally laid down for it.

Various investigators have prepared white Portland cement at different times. Some of the earlier of these experimenters seemed to doubt the probability of carrying out the process on a commercial scale. Later investigators, however, seem to agree that there should be no trouble in putting the process on a working scale, provided proper raw materials could be found from which to manufacture a white cement. This latter seemed to be the rub and lately very little has been heard about the subject because of the scarcity of such material.

In order for Portland cement to be white it is necessary that the raw materials, clay and limestone, or clay and marl, shall be practically free from iron. Iron adds nothing to the strength of cement, but, as it is present to the extent of at least one or two per cent in most rocks, it is a hard matter to procure limestone and clay free from this element. The writer, however, recently had brought to his attention a fine deposit of limestone, situated near good shipping facilities, eastern cities and abundant water supply, which contained practically no iron. As white clay was abundant in the same region, the problem of making a white Portland cement naturally suggested itself to him. The analyses of these materials is given below:

Limestone.

Silica	0.26
Oxide of Iron	0.04
Alumina	0.16
Carbonate of Lime	96.78
Carbonate of Magnesia	3.00

Clay.

Silica	66.00
Oxide of Iron	0.16
Alumina	23.84
Lime	trace
Magnesia	0.09

The writer had no trouble in burning a mixture of these two, made in about the proportion of one of clay to 3.7 of limestone. The resulting clinker was very faintly tinged with green, but gave a perfectly white powder on grinding to the fineness of commercial cements. The burnings were made in both a small gas furnace and also in a small upright kiln, using charcoal as a fuel. The cement burned in the latter was not quite so white as the former, as it contained a little of the charcoal gas. Both cements gave good tests as follows:

Boiling test, O. K.

Cold water pat, 28 days, O. K.

Fineness—Residue, on No. 100 sieve, 2 per cent; on No. 200 sieve, 19 per cent.

Initial set (after adding 2 per cent gypsum) 1 hour and 15 minutes.

Final set, (after adding 2 per cent gypsum), 4 hours.

Tensile Strength.

1 day neat	425 lbs.
7 days neat	668 lbs.
28 days neat	840 lbs.
7 day sand (1-3)	33.5 lbs.
28 day sand	415 lbs.

Some writers, experimenting with white Portland cement, experienced difficulty in obtaining a clinker which would not dust on cooling. This is a difficulty which is apt to be met with in experimental kilns and even with the ordinary upright kilns, and is probably due to the burning of the clinker by a reducing flame and also to the slow cooling which takes place in these. It is a trouble I have never heard of in connection with rotary kilns because the clinker is rapidly cooled and the burning is done with an oxidizing flame. No trouble was experienced, however, in burning a non-dusting clinker from the above material in either the gas or charcoal fired kiln.

The statement has also been made that such white cement could not be burned because of the lack of the fluxing action of the iron. The writer found no difficulty in burning this material in the kilns mentioned, and the temperature of these can easily be duplicated in the rotary kiln. Easy burning can be secured by fine grinding of the mixture before burning.

The process for manufacturing the white Portland cement differs little from that now used for ordinary Portland cement. The raw material should be finely ground, but not excessively so. The burning could not be done with coal on account of the ash in this, but would have to be done with crude oil or producer gas. The recent successful use of producer gas at the plant of the Diamond Cement Company, Middlebranch, O., removes any doubt about the use of gas for burning.

The cost of the process for making the white Portland cement will be only a few cents a barrel (at most) more than the cost of making ordinary Portland cement, from clay and limestone, elsewhere. The deposit of raw materials is favorably located for shipping and coal can be procured cheaply. If a modern mill is built the cost of making the white cement will be less than that of making ordinary Portland cement at many mills. At the present time the stainless cements mentioned in the earlier part of this article sell for three or four times as much as ordinary Portland so there should be a big profit in the manufacture of a white Portland cement, and as soon as sufficient capital can be interested in the project a mill will be built to utilize this deposit of clay and limestone.

Nazareth, Pa., July 19, 1905.

Mr. Wm. Seafert, Editor, care Cement and Engineering News, 226 La-Salle St., Chicago.

Dear Sir:

Thank you for your kind letter of a recent date and as you suggest I enclose a short article on the white Portland cement. I am having a few paper weights made up of the cement and as soon as I get one will send it to you. Any help you can give me in the way of securing help to build the mill will be appreciated and I will see that Cement and Engineering News has a big advertisement for the new cement when it is made. I should like the article to appear shortly, if possible in the July number.

Sincerely yours,
Richard K. Meade.

CONCRETE BLOCK INSURANCE.

Sid L. Wiltse.

Concrete block insurance is one of the most important subjects to be considered by this convention. As stated by Mr. Seafert at last night's banquet, great progress is being made in this particular line. Mr. Sanduson of Chicago, who exercises some sort of a rate making power in 16 states, is willing to make a rate in his territory providing we can assure him that our product will be well made up to a certain standard which will merit the approval of his committee. We are all glad to hear this. Mr. Cairns, who is chairman of a fire prevention committee, may give us additional information on this subject in his paper here to-day.

The United States government and the leading railways have come together under an advisory board to test materials of construction. Dr. Dudley of Altoona, Pa., is president and Richard L. Humphrey is secretary. This board wants samples of concrete block made by themselves on any machine the Cement Machinery Association is willing to furnish, because all tests made by experts must be made under their own supervision. It is therefore up to the individual cement machine manufacturers to furnish the machines independent of each other. The progress of the cement block is now in a fair way of being given proper tests by strictly impartial experts in the interest of the consumer. The report of these experts will carry weight and insure confidence with the general public in cement block construction, as we all know that a properly made block must be all right. We know also that they will stand fire and the elements better than any other material.

THE PORTLAND CEMENT INDUSTRY IN CANADA.

James Walker and Morris M. Green.

When Canadian cement manufacturers are undersold by American rivals in their own market, as has happened recently in Hamilton, they must naturally reflect deeply as to the why and wherefore. People in the United States are not making cement for amusement, and if they secure Canadian trade, it might be inferred that their action was based on a cheaper cost of production. We shall, therefore, in this article, call attention to certain conditions affecting the cost of Portland cement in both countries. Portland cement, chemically speaking, is a double silicate of alumina and lime, of approximately the following composition.

	Per cent.
Silica	20 to 23
Alumina	6 to 10
Lime	60 to 65

We will take the following as a fair illustration of an American cement:

	Per cent.
Silica	22
Alumina and iron	9.4
Lime	64.50

As a barrel of cement contains 380 lbs., net, there is required to produce this, about 245 lbs. of pure lime, and 120 lbs. of dry silica and alumina.

These quantities are equivalent to about 450 lbs. of dry limestone or marl (95 per cent. CaCO$_3$), and 150 lbs. of clay, containing 20 per cent. moisture, or 125 lbs. dry shale.

We will now discuss the different sources of the lime and the alumina and silica, which are used by the rival manufacturers in the United States and Canada.

A

1. Pure Limestone.—For cement manufacture, limestone is not generally used with less than 95 per cent. CaCO$_3$. Where the stone is found in deep beds and well exposed, it may be quarried in lumps of 6-in. size for about 40c. a ton. Limestone does not contain over 2 per cent. of moisture, ordinarily, and, while it must be dried preparatory to fine grinding, the cost is insignificant.

2. Pure Marl.—Marl of 95 per cent. CaCO$_3$, or better, is found in abundance in the United States and Canada. Its relative merits and demerits may be expressed as follows:

Merits.—1. Granular form, requiring less pulverizing than stone.

2. Cheap excavating cost. At the Omega Cement Co.'s plant, Jonesville, Mich., a cubic yard, or 3,000 lbs. of wet marl, averaging 60 per cent. moisture, can be dredged and taken to the 500-barrel cement mill, close at hand, for 6c. a cub. yard. As one cub. yard makes 2½ barrels of cement, we may safely allow 3c. a barrel for excavating cost.

Demerits.—1. Large percentage of moisture, owing to its presence under water in lakes or in low ground, where its porous nature leads to absorption of water. The dryest marl we have ever seen contained 40 per cent. moisture. As will be shown later on, this excess moisture leads to extra cost for fuel, also necessitates extra capital for extra machinery, thereby saddling fixed charges upon cost of cement.

2. Liability to organic impurities, also difficulty of determining where good marl ends and bad begins, with sub-aqueous deposits that are out of sight and not easily examined.

B

Sources of Silica and Alumina.—1. Shale.—This is generally considered preferable to clay, owing to its lack of moisture. It is also apt to be more homogeneous and less liable to contamination by pebbles and grit.

2. Clay.—Clay usually contains 20 per cent. moisture. This leads to expense in drying, also renders it a sticky, unwieldly material to manipulate.

C

1. Lehigh Cement Rock.—In the Lehigh Valley region of Pennsylvania, occur large deposits of an argillaceous limestone, which have made it the greatest cement-manufacturing district in the world, both as regards extent and cheapness of production.

The rock is of the following composition:

	Per cent.
Calcium carbonate	70.10
Silica	15.05
Alumina	9.02
Iron oxide	1.27

By adding 75 lbs. of pure limestone to 500 lbs. of this Lehigh rock, we get a mixture which can be ground and burned to make a Portland cement. Both materials are practically dry and require a minimum of fuel for drying their content of moisture preparatory to pulverizing. The Lehigh rock occurs in very thick, open breasts, where the stone can be taken out for 30 cents a ton, and some of the mills are immensely large, reducing general expenses per barrel of cement to a minimum.

2. Blast Furnace Slag.—At the plant of the Illinois Steel Company, in South Chicago, Ill., a blast furnace slag of the following composition is used for making excellent Portland cement:

Dry Slag:

	Per cent.
SiO$_2$	34
Al$_2$O$_3$	12 to 13
CaO	48
MgO	3

The granulated slag contains 20 per cent. moisture.

For a barrel of cement, there are needed 200 lbs. of limestone and 350 lbs. of undried slag. After drying the slag, we need only 280 lbs. of dry slag granulated and 200 pounds of limestone, or a total of 480 pounds only of material per barrel of cement. Of this 480 pounds, 280 pounds occur as material already granulated, therefore implying a saving in pulverizing.

The following table will show the relative consumption of coal per barrel of cement in rotary kilns, using dry and wet feeds; also the output of the kiln in barrels of cement:

	Lbs. coal per bbl. of C'm't	Output of kiln per Diem.
Dry mix	120	200
Slurry, 40 per cent moisture	160	125
Slurry, 60 per cent.	200	100

In a dry process kiln, enough waste heat passes off to dry 30 per cent. moisture in the feed. With careful work, some marls when mixed with dried pulverized clay, will give a slurry containing not over 40 per cent. moisture, which can be pumped into a kiln.

At its best, however, it can be seen that a marl cement plant takes 25 per cent. more kiln fuel and has only 62½ per cent. of the capacity per kiln of a cement plant using a dry mixture of limestone and shale. In a dry process kiln, the waste gases pass off at a temperature of 1,900 deg. F. One American plant passes such hot gases from two kilns into a waste heat boiler. In this boiler the gases generate 300-h.p., being reduced to 600 deg. F., thence passing through an economizer by induced draft, and heating feed-water to boilers. The boilers are supplemented by coal with hand firing.

	Drying Fuel. Lbs.	Kiln Fuel. Lbs.	Boiler Fuel. Lbs.	Total. Lbs.	Remarks.
Limestone and shale...	5	120	70	195	Waste heat not recovered.
Limestone and shale...	5	120	30	155	Waste heat recovered.
Limestone and clay....	10	120	70	200	Waste heat not recovered.
Limestone and clay....	10	120	30	160	Waste heat recovered.
Marl and clay slurry, 60 per cent moisture....	5	200	70	275	Waste heat not recovered.
Marl and clay slurry, 40 per cent moisture....	5	160	70	235	Waste heat recovered.

These two kilns each turn out 250 barrels per diem, using 120 lbs. of coal per barrel.

As the motive power allowed for cement mills is usually 1-h.p. per diem for each barrel of output, equivalent to 70 lbs. of coal, it is evident that this method of saving waste allows cement to be made with 30 pounds of boiler coal and 120 pounds kiln coal. The following table shows coal required for drying raw materials, for kilns, and for boilers, using different materials:

Equipment and Process of Canadian Cement Plants.

The cement industry in Canada originated with marl and clay as raw materials. Some of the plants installed drying plants for the marl. This, while it increased the capacity of the rotary kilns, led to a very high consumption of coal, as well as large outlay of machinery and labor for drying the marl.

Some of these Canadian marl plants also freight their marl from a deposit to a mill. Paying freight on the water in the marl is an expensive business. Also clay is hauled some distance to the mills. Clay cannot be excavated cheaply in small quantities; adding freight on 150 pounds per barrel of cement increases the cost. There being no coal in Canada between Nova Scotia and the Rockies, Ontario cement mills must import American coal, paying a tariff upon it. Many of the Ontario mills have been placed in rural districts, remote from their best market, and at the mercy of a single railroad line.

It can be said that most Canadian mills use too much coal, for which they pay much higher prices than their American competitors.

Their mills are too small to make cement economically, and are handicapped by long hauls to markets. It is unfortunate that the Canadian cement industry did not originate with large mills using limestone, instead of the present large number of small mills using marl. It is gratifying to note that one large mill using limestone has recently been built, also that blast furnace slag will be used for Portland cement manufacture in Nova Scotia. With proper management the latter cannot fail to be a success and a source of pride to Canadians.—The Canadian Engineer.

A LIGHTHOUSE OF REINFORCED CONCRETE.

By Emile Guarini.

A lighthouse of reinforced concrete has recently been constructed at the mouth of the Boug, a river flowing into the Black Sea. It is situated 115 feet from the river shore and serves, with an existing but lower lighthouse, to guide vessels in the direction of the maritime canal excavated in the river and connecting with the sea the city of Nikolaew, which is situated about 100 versts from the mouth of the Boug. The construction of the lighthouse of reinforced concrete was decided upon after a comparative study of other projects, some calling for the use of bricks and others of iron. Reinforced concrete was found to give a saving of about 40 per cent with an equal stability.

The system consists of a tower of which the walls are from 5 to 10 inches in thickness and are constructed upon a foundation, likewise of reinforced concrete, and imbedded in the sandy soil to the depth of 10 feet.

The stability is assured by the weight of the sand resting upon the foundation. The maximum of pressure upon the ground is about 7 pounds to the square inch. The coefficient of stability at the level of the ground is 4.

The frame is formed of round iron bars of 1¼-inch diameter. The calculation is so made that it shall be able, without the concrete, to resist a wind pressure of 55 pounds to the square foot. The height up to the lantern is 110 feet.

The diameter of the tower is 21 feet at the base and 6½ at the lantern.

The lantern is divided into two parts, one of which serves as the dwelling of the keeper, while the other is arranged for the lighting apparatus.

For the concreting there was constructed an external wooden wall having exactly the form of the tower. The concreting was done from the interior. The concrete was formed of sea gravel, coarse sand, and the Portland cement in the proportion of 1:2:4.

The concreting was done in winter, in the space of two weeks, with the aid of heat in the interior. The external woodwork required two months for its construction.

The external woodwork was removed in the spring of 1904, and, up to the present, although the tower has been submitted to the action of very high winds, no evidence of strain has been detected.

The cost of the structure, exclusive of the lighting apparatus, was about $6,000.

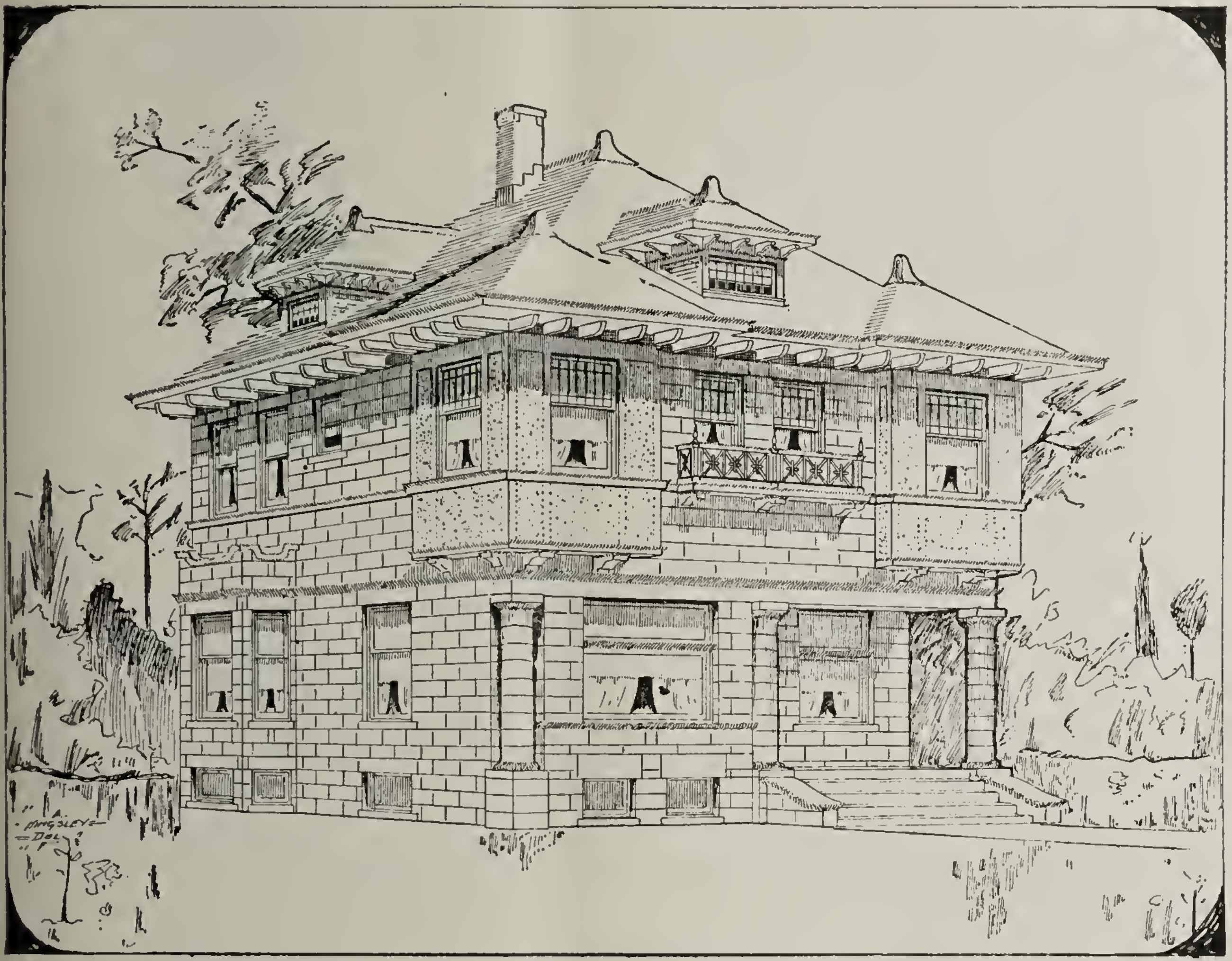
The project, the calculations, and the execution are due to M. N. Piatnitsky, engineer of ways of communication, and the architecture is the work of M. A. Bauchnikow, likewise engineer of ways of communication. —Scientific American.

INCORPORATED.

The Chautauqua Portland Cement Company, of Rochester, N. Y. Works at Cassadaga, Chautauqua county, N. Y. Capital stock, full paid up, $250,000. President, Uriah Cummings, Akron, N. Y.; vice president, Henry W. Spooner, Erie, Pa.; sec'y and treas., John H. McLauchlan, Owen Sound, Ontario. Directors—Uriah Cummings, Henry W. Spooner, John H. McLauchlan, Willis R. Van Der Mark, Rochester, N. Y., and H. O. Alderman, Rochester, N. Y.

DESCRIPTION OF CONCRETE BLOCK RESIDENCE HEREWITH DISPLAYED, DESIGNED BY WM. M. KINGSLEY & CO., ARCHITECTS, ROCKEFELLER BUILDING, CLEVELAND, OHIO.

We endeavor in this issue to demonstrate the artistic relations of hollow concrete building blocks applied to a modern residence, using nothing but stock sizes (except for columns, window caps and sills) which can be made on any block machine making a block 32 inches long. Blocks of other length, however, can be used in the erection of this building without impairing the appearance in any way. The basement is constructed of 12-inch wide blocks, first floor 10-inch wide blocks, and second floor of 8-inch wide blocks, front porch having concrete floor.



A CONCRETE BLOCK HOUSE.

The first floor contains reception room, parlor, dining room, kitchen and rear lobby. Arched opening between reception room and parlor, doors from reception room to dining room and kitchen, sliding doors between dining room and parlor, passage through pantry from dining room to kitchen, stairs to second floor and basement, refrigerator space in rear lobby and china closet in dining room.

Second floor contains four large chambers, bath room, linen closet, with closet off each chamber. The lavatory is located between two main chambers and stairway to attic.

Basement under entire house with laundry room, coal bins, and vegetable cellar, with entire floor of concrete.

This house can be built in Cleveland, using oak finish for reception room, parlor and dining room, Georgia pine for balance of house, with hot water heat and electric lighting, for $4,200.

The general dimensions are 29 feet wide and 34 feet long, with 7 feet for basement, 9 feet 3 inches first floor, 8 feet 6 inches second floor. Any further information can be obtained from architects upon application.

It is reported that the Atlas Portland Cement Co. will erect a new plant on its holdings between the Alpha and Vulcanite Portland Cement Works. Engineers on the tract for some time.

The Leifer Manufacturing Co., Little Rock, Ark., has been formed to manufacture cement building blocks, to begin work August 1st, 1905. The directors are: Geo. Leifer, J. F. Lenon, M. J. Baker, H. K. Ford, J. K. Riffle, Geo. W. Sappington and S. G. Woodsmall, with officers as follows: Geo. Leifer, president and general manager; M. J. Baker, vice president; H. K. Ford, secretary, and J. F. Lenon, treasurer. The company will likewise make cement curbing, roofing, tile and other concrete specialties.

A concrete block cold storage plant is under erection at South Lima, Livingston county, N. Y. The building is 50x80 feet and will store 50,000 bushels of onions.

NEWS ITEMS.

Constantine, Mich., has a cement building block factory.

Lewis Larson of Hallock, Minn., will manufacture cement blocks.

Hugh Dickinson, of Velva, N. D., will manufacture cement blocks.

John Washburn will open a cement building a block factory at Pratt, Kansas.

E. H. Samuelson of Boone, Iowa, is manufacturing cement building blocks.

Olson Bros., of Ivanhoe, Minn., have purchased a cement block machine.

M. Routt and R. Russell, of Washington, Ind., will open a cement block factory.

The Illinois Gravel Co., of Sheffield, Ind., are making cement blocks at Sheffield, Ind.

The Neola Cement Block factory, at Neola, Ia., is enlarging its plant, to meet increasing orders.

Al. McClure, of Lohrville, Ia., has just commenced the manufacture of concrete building blocks.

M. H. Newell and L. Wade, of Muskegon, Mich., have started to make concrete building blocks.

The Ashland, Ohio, Granite Block Co. has been formed and commenced manufacturing concrete block and the Harvey Concrete Fence Post.

H. W. Caldwell Company of Chicago, Ill., are now exclusive selling agents for the United States for the genuine Salem elevator buckets, originally manufactured by W. J. Clark & Co., Salem, Ohio.

The application made by George Barrie of Philadelphia for a receiver for the National Portland Cement Company's plant has been denied by the Northampton County Court. Mr. Barrie likewise applied for an injunction to prevent the sale of the plant. Mr. Barrie was the owner of $41,000 of the company's bonds and has now been paid. The plant is now to be sold on July 20th as advertised.

CONCRETE BLOCK CONSTRUCTION.

The Cement and Engineering News will publish a treatise on concrete block manufacture and use by S. B. Newberry, to appear in its August issue, and subsequently in book form.

POSITION WANTED.

Position Wanted, as Manager or Superintendent of Portland Cement plant; established or projected; good salary required; can make plans and superintend erection. Good references, including present Company. C. Q., care of Cement & Engineering News.

The Empire Portland Cement Co. has executed a mortgage on its holding to Chas. Miller for $125,000.

G. A. Gould & Son of Davenport, Iowa, have commenced the manufacture of cement blocks, and have three dwellings under contract.

The Texarkana Concrete Building Company of Texarkana, Arkansas, has been chartered. The capital stock is $10,000, of which $3,000 has been subscribed. H. W. Hollenberg, president; W. H. Booth, vice president; Ralph G. Moore, secretary and treasurer; C. E. Haydon, L. W. Mosson, George S. Valliant and Ralph G. Moore, directors.

SITUATION WANTED—As assistant superintendent and mechanical engineer in cement mill. Seven years practical experience. Wet and dry process. Can introduce new designs and improvements. First-class references. Address G. E. F., care Cement & Engineering News.

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Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

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AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

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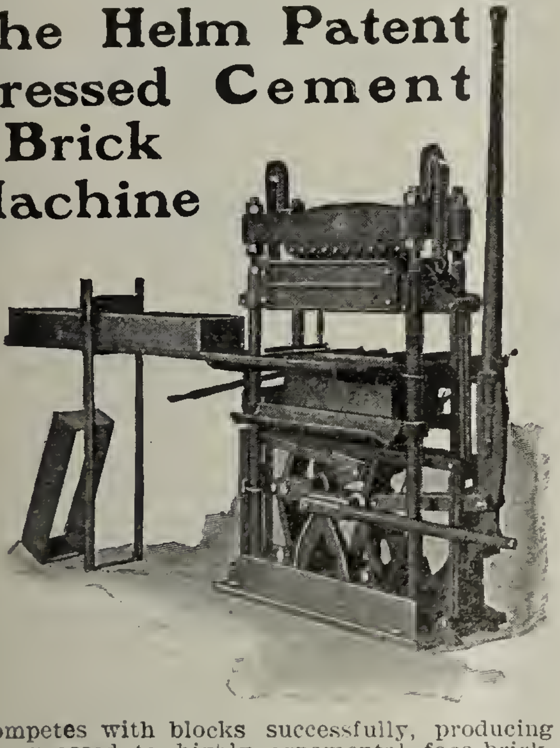

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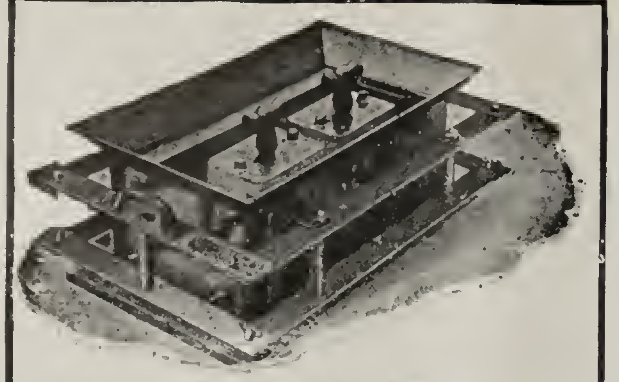

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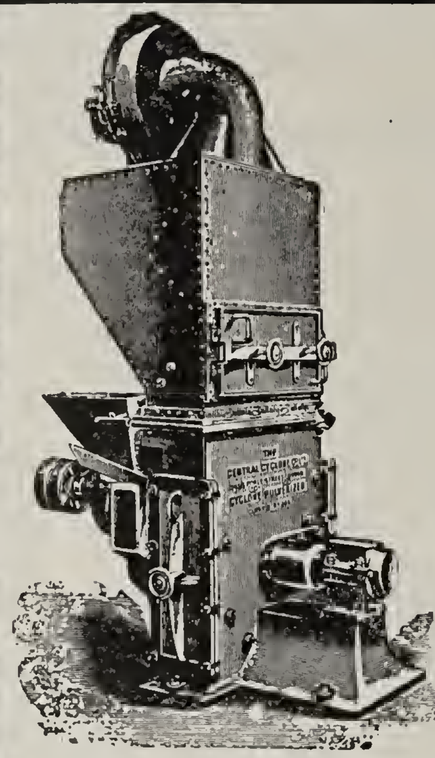

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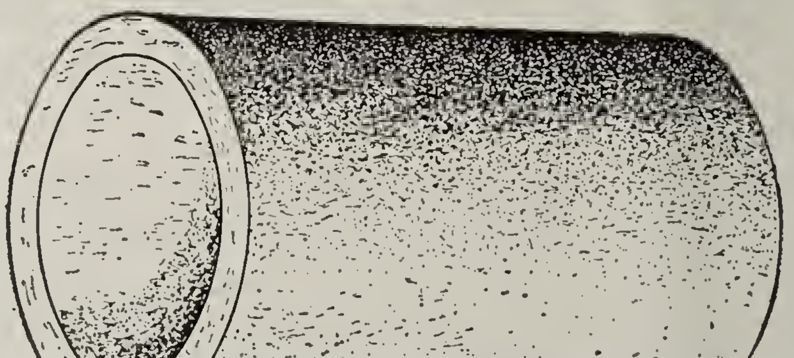

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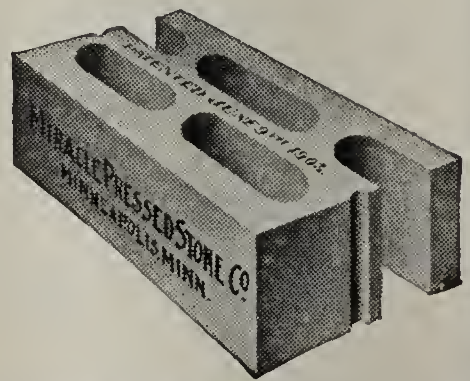
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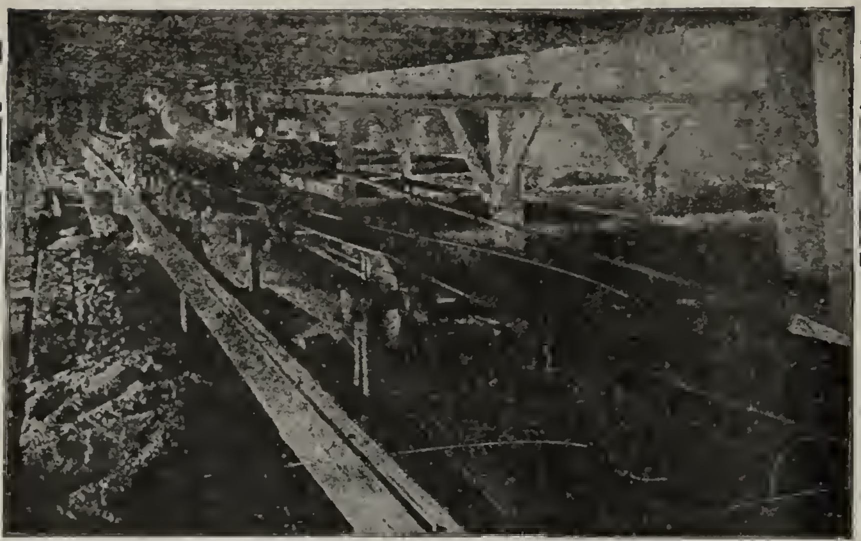

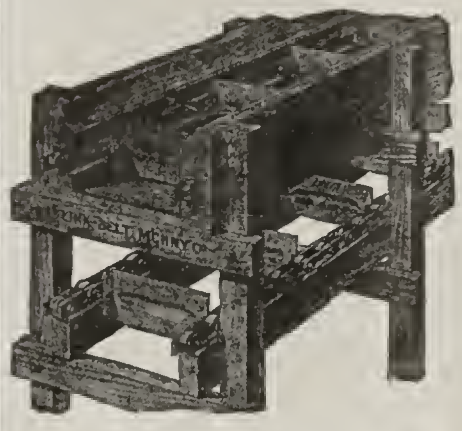

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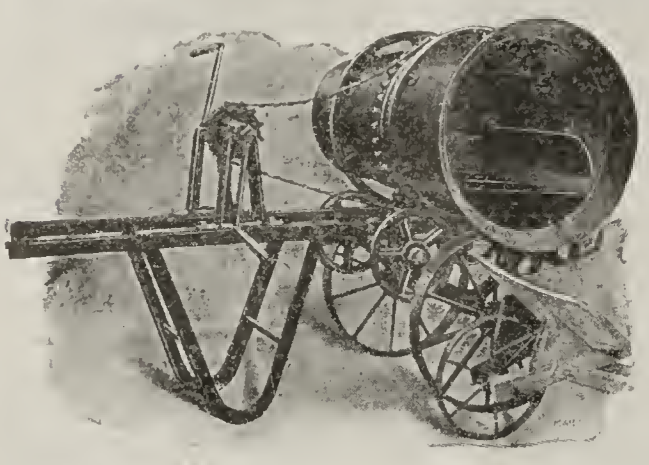

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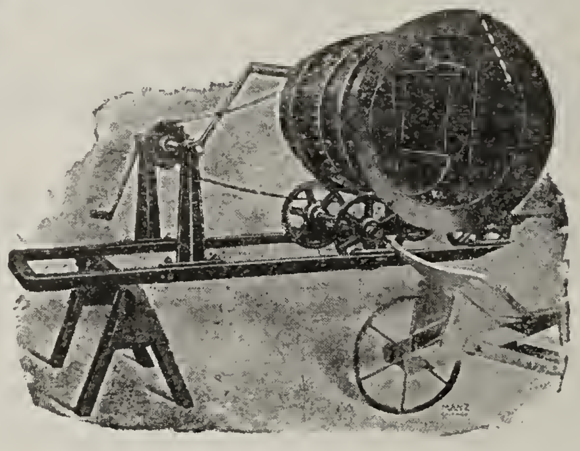

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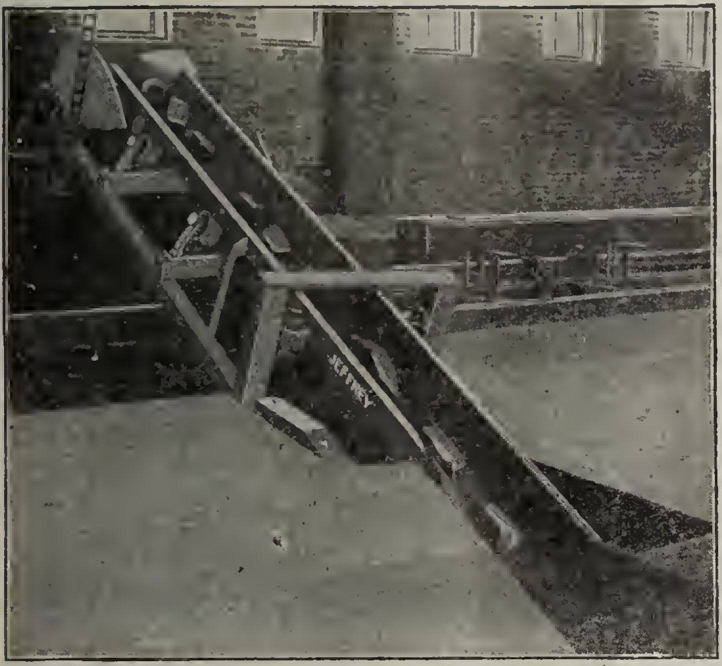

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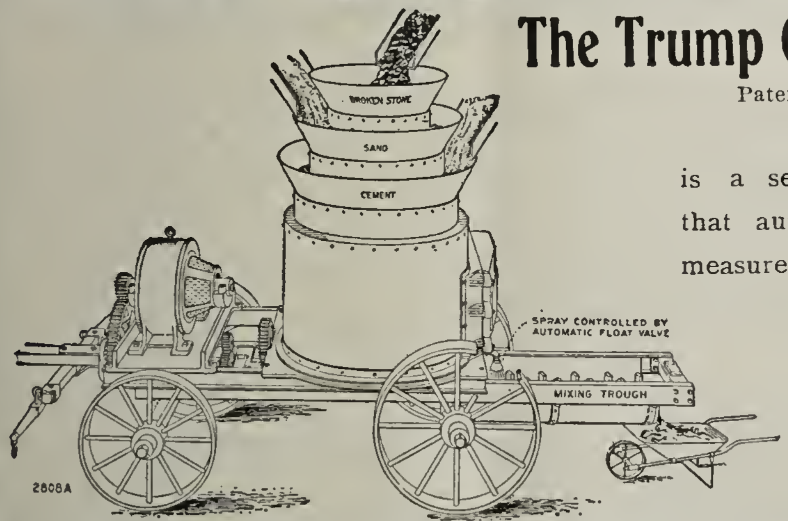

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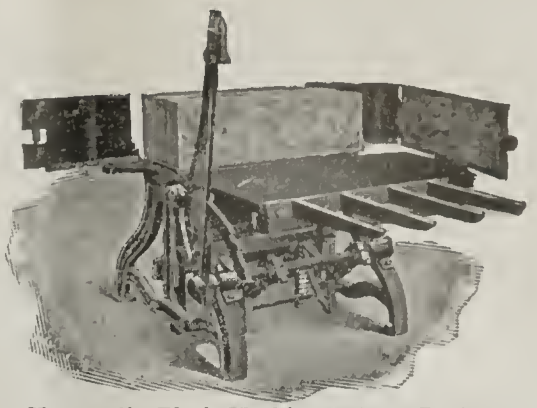

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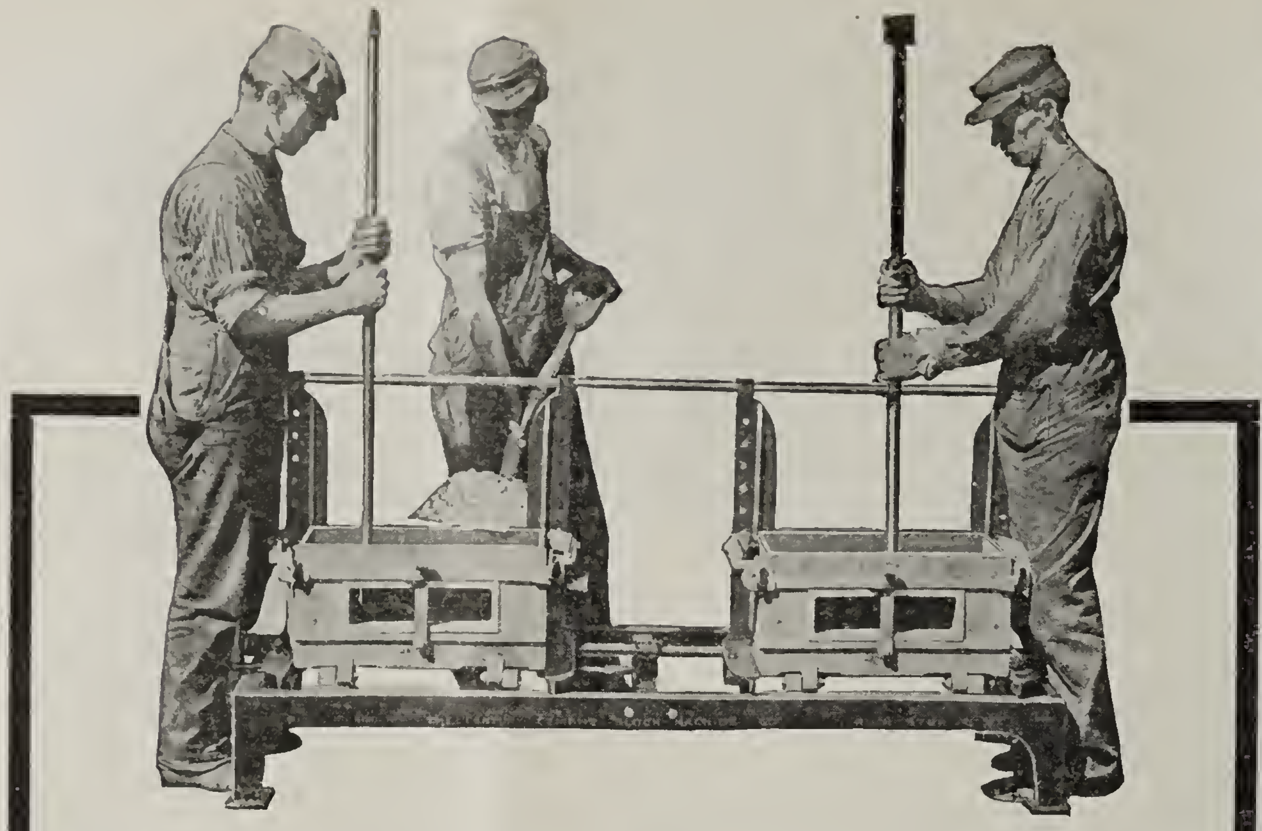

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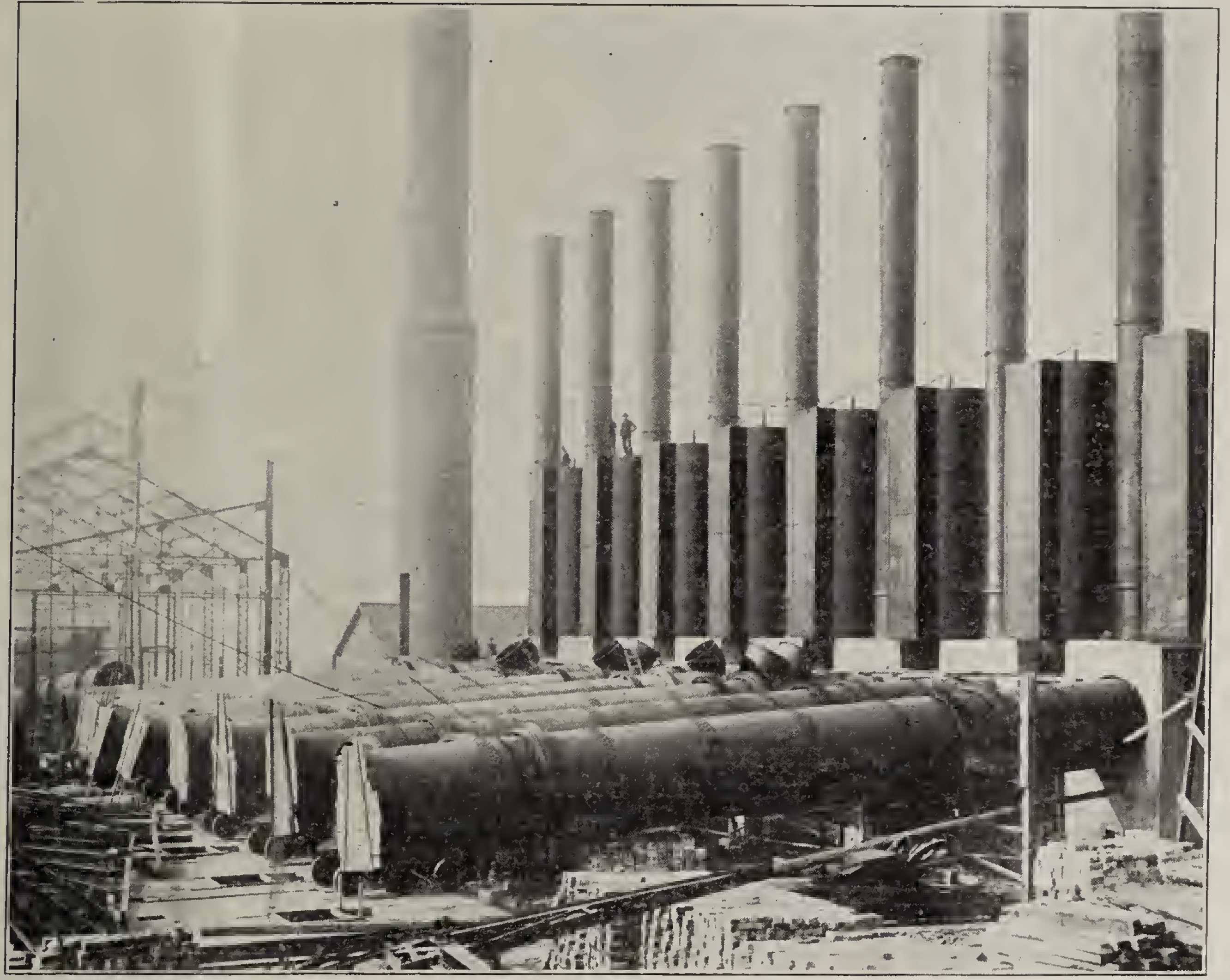
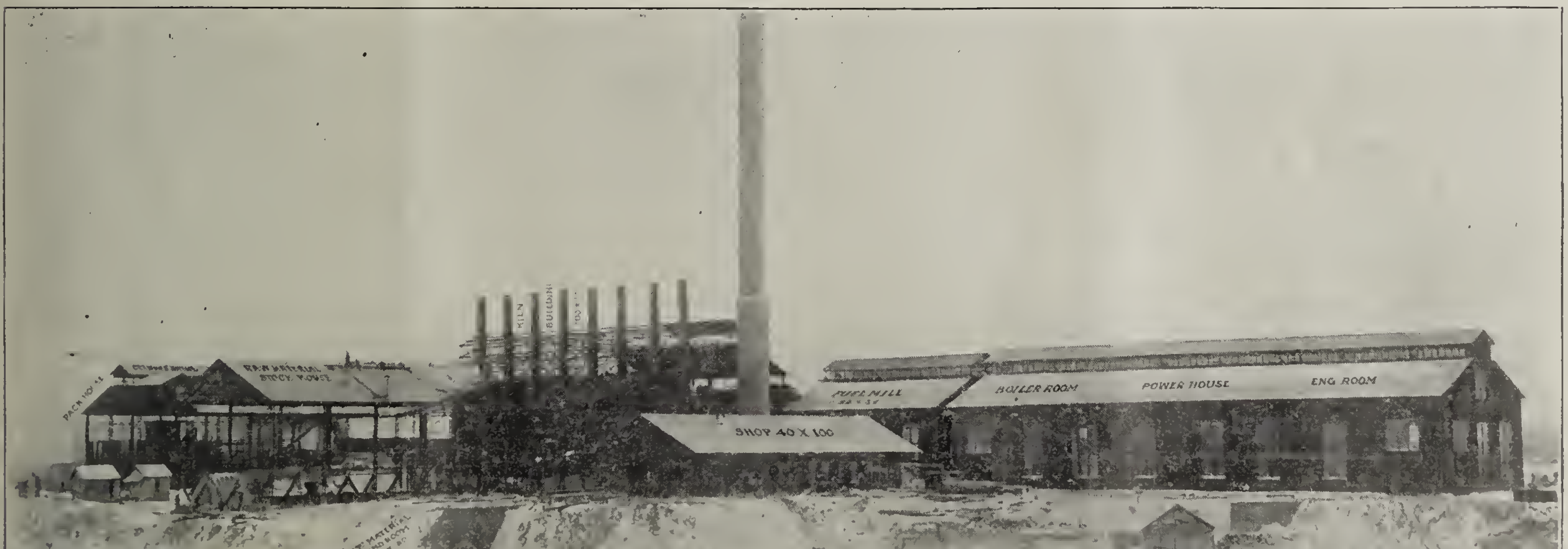


Eight Rotary Kilns in Place. Burt Portland Cement Works.



Burt Porland Cement Works, Bellevue, Eaton Co., Mich.

See page 155 for description.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
OFFICE—226 La Salle Street.
Cable Address—"Seafert," Chicago.

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CHICAGO, AUGUST, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

ARCHITECTS AND THE CONCRETE BLOCK INDUSTRY.

At last the American architects are falling into line for concrete building block construction, due to the fact that their clients will have them, with or without their approval and advice. It is simply a case where the owner and actual builder has outstripped the architectural profession. Therefore, the architect must surrender the business to his more progressive rivals or meet the exact wants of his clients by adopting the concrete block. The minds of the great majority of American architects have heretofore been saturated with prejudice, pure and simple, which began to affect their pockets, their income and even their professional standing in the community, especially with monied men who invest in building operations. Capitalists first figure the cost and expense, next the returns the capital will bring in each particular enterprise, and certainly the enterprise which will bring the greatest return for a given sum is most likely to be adopted. In this respect, the concrete building block construction will show the greatest margin of profit, when compared with brick and stone, and when repairs and deterioration are considered, even wooden structures are not advantageous, when strict and impartial investigations are made. Wooden structures are not fireproof and call for higher insurance rates, while in thickly populated communities, wooden buildings are absolutely prohibited. Even where wood can be freely used, first class material is yearly growing scarce and consequently dearer. This, with the high priced labor of carpenters and joiners as compared with the ordinary labor employed in forming and setting concrete building blocks, all goes to show that concrete is the ideal material, which must upon its intrinsic merits supersede the less durable and higher priced material now in the market. The architect, in almost every community, to-day sees concrete building blocks going up in solid, durable structures, of neat and handsome design. The architect who has fallen into a Chinese rut, does not like them; his education, training and practice revolt at the innovation; they are not in harmony with his preconceived notions of building construction; yet his business is slipping away from him and without a convincing argument to stay or retard this new innovation in building construction.

An incident of this kind came to the writer's notice, where an architect assumed that he would be doing violence to the ethics of the profession in constructing such a building, but to oblige a friend as well as to prevent the business from going to a rival, he agreed to prepare plans and specifications for a concrete block dwelling house. While these plans were under way, he said, "I was afflicted with a half guilty conscience that I was lowering myself in the eyes of my friends and fellow architects, who in common with myself had freely condemned this class of construction. The plans were prepared under mental reservation. I would have renounced them gladly, yet, when the actual building was under way, I began to take water and before the building was complete, I was convinced that the concrete building block construction was all right." This has been the case with architects generally, in the past. The conversions are now so rapid and extended, it will be a short time when the concrete will be the favorite material for construction for the majority of architects throughout the country.

REINFORCED CEMENT DOME.

A reinforced dome and tower is under construction at the Central Railway passenger station at Antwerp, Belgium. The tower rises from the top of the main building at an elevation of 130 feet, and is carried up to 260 feet above the ground, surmounted by a dome forming an arch of 32 ft. 8 in. radius, 68 ft. 4 in. diameter. The dome has a double shell 6 ft. 6 in. from shell to shell, contracting to 3 ft. 3½ in. under the apex. The face of the inner shell forms the ceiling of the dome and is highly ornamented and paneled, all moulded in place as the work progressed the outer shell of dome is 3.15 in. thick. The completed dome weighs only 1,800 pounds. The difference in weight between reinforced concrete and any other form of substantial construction was the leading cause for the adoption of reinforced concrete in this work.

QUICK METHOD FOR DETERMINING LIME.

By Edmund Johnson, Yankton, S. D.

There is no other determination which the cement chemist has to make so often as that of lime. There are two quick methods in general use for doing this, i. e., titration with standard acid and alkali solutions, and estimation by means of the carbon dioxide apparatus. While these methods work well with most materials, their accuracy is interfered with by the presence of magnesia and sulphur. Where the magnesia and sulphur are present in constant amounts, the "personal equasion" of the methods may be determined and corrections made. However, if magnesia or sulphur be present in varying amounts the two above methods are rendered useless.

The writer devised and has been using for three years a method which overcomes these objections and while slightly longer is yet short enough to be called a "quick method," and has the additional advantage that it can be used on finished cement as well as raw materials. The method is as follows:

.2 gram of the sample is weighed out and transferred to a 400 cc. beaker and sufficient strong HNO_3 and HCl added to effect a solution (if the sample be cement, it should be shaken up with a few cc. of water before adding the acids to prevent caking). Place beaker on hot-plate and boil about three minutes, then dilute with hot water to about 200 cc. and add NH_4OH to alkaline reaction and bring to a boil again. Now add 15 cc. of a saturated solution of $(NH_4)_2C_2O_4$. Boil three minutes longer, let settle two minutes and filter and wash twelve times with boiling water. Put about 75 cc. of cold water in the beaker used for precipitation and add 10 cc. of concentrated H_2SO_4. Dilute with boiling water to about 300 cc. and drop in the filter-paper and titrate with standard $K_2Mn_2O_8$ solution. If the permanganate solution be of such strength that 1 cc. $=$ 0.002g. CaO the percentage of CaO may be read from burette. The HNO_3 is necessary in dissolving the sample in order to oxidize ferrous iron to ferric form; otherwise it would precipitate as ferrous oxalate later on and make result too high.

Logan Portland Cement Co., Jersey City, N. J., has purchased lands in Allen County, Kan., for erection of factories to manufacture Portland cement. Capital $1,500,000. Jno. E. Logan and others. Logan Portland Cement Co., No. 15 Exchange place.

SHRINKAGE IN THE HYDRAULIC CEMENT INDUSTRY.

The natural cement industry in Clark county, Indiana, is on the decline, due to low prices for Portland cement. The last natural cement mill in the Sellersburg district has shut down with the warehouses full of cement. The Speeds' mill, ten miles from Sellersburg, is being converted into a Portland cement plant. Four years ago the natural cement mills in Kentucky and Indiana, experienced a "boom," after which time business has been slow. At Cementville and Watson, Clark county, Indiana, five and eight miles from Sellersville respectively, once thriving communities, are now dead beyond resurrection. They are actually disappearing. The houses in which people lived are being torn down and moved away. Sellersburg still exists, but many of its prominent citizens have been forced to the wall or have left for other places.

Of the mills which once did a thriving business the Watson, Ohio Valley and Gheens have fallen into decay. This summer Speeds and Belknaps made a three months' run, and the United States one month only. The Banner, Hoosier, two mills at Charlestown and Haussdale, all recently built, have done little work, and their quota is now usually made by the big mills, according to the terms of the combine to which all the mills belong.

The money loss by the idleness of the mills is large. Speeds, Belknaps, Standard, Banner, Hoosier, Haussdale, Clark county, United States and Black Diamond represent an aggregate capital of about half a million dollars, and the loss in labor and trade also is immense. About one thousand men used to be employed in the mills, which are now entirely idle part of the year, and never running with more than one-quarter of that force. The cause was Portland cement and the recent discovery of shale, necessary for the manufacture of this commodity, and the erection of the new Portland mill at Speeds is the one hope of the Clark county cement industry.

Miracle Pressed Stone Company exhibit at the Lewis and Clarke exposition at Portland, Oregon. The building is constructed of the Miracle double air spaced concrete block, and contains complete outfits of the various cement product machinery made by the company.

CATALOGUE.

The Miracle Pressed Stone Co., of Minneapolis, Minn., has issued a large 12x9-inch catalogue, describing the various cement building block machines and appliances manufactured by the company, with numerous illustrations, showing the method of making concrete building blocks as carried on in actual work, with views of store buildings, dwellings, club-houses, armories and opera houses, flat buildings, churches and other structures built with the Miracle building blocks. One double sheet shows the Miracle block forms assembled as well as each individual piece of which the form is composed with the different styles of finish the form can produce, and the price of each particular set of forms that go with each outfit. For instance, the Miracle cap and sill forms cost $45.00, while the chimney and porch forms range from $30.00 to $40.00 per set. Elevations and floor plans of buildings are shown for which complete plans and specifications are furnished at $25.00 each. The Miracle moulds for making concrete sewer pipe of various sizes as well as their sidewalk tile machines, the Miracle Re-inforced Fence Post Machine and Cement Brick Machine are shown for which prices are given.

This company have for sale every requisite and appliance for the manufacture and handling of cement product. The pamphlet covers 60 pages and will be sent to parties interested on application to the above address.

"Standard Methods of Testing and Specifications for Cement." Edited by Richard L. Humphrey under the directions of Committee C on Standard Specifications for Cement of the American Society for Testing Materials. The pamphlet covers:

1. Uniform tests of cement. 2. Standard specifications for cement. 3. Uniformity in methods of analysis for limestones, raw materials and Portland cements.

The Vicat Nedle apparatus is minutely described and illustrated with specific directions for its use. The form of briquette is shown in a detail drawing as well as the molds in which the briquettes are formed. The Le Chalelier Specific Gravity apparatus is likewise described and illustrated. The form of clip used in breaking the briquette is illustrated. This pamphlet can be had on application to Professor Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., or to the Wm. G. Hartranft Cement Co., Fordwick, Va.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JUNE				TWELVE MONTHS ENDING JUNE			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	67,200	$ 270	130,000	$ 491	44,247,048	$ 141,148	1,127,424	$ 23,401
Belgium...........	9,629,978	26,735	7,109,939	24,011	187,055,864	559,318	156,636,640	506,940
France............	1,119,700	4,804	1,488,200	5,095	12,061,278	42,626	8,942,399	33,461
Germany..........	6,356,256	20,841	22,807,735	77,607	356,570,218	1,213,905	216,033,876	697,242
All Other Europe	....	....	238,097	599	5,321,740	14,591	1,465,598	4,823
British North Am.	35,000	185	56,360	720	967,515	4,553	217,875	2,125
Other Countries..	600,000	2,316	160,000	509	4,268,296	17,162	2,276,324	8,605
TOTAL...........	17.808,134	55,151	31,990,331	109,032	610,291,961	1,993,303	382,754,136	1,276,597
Domestic Exports of Cement, bbls.	57,802	85,576	109,714	146,558	362,503	530,216	1,067,284	1,480,795

There were 10,787,763 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in June, 1904, valued at $34,279, against 7,939,436 lbs in June, 1905, valued at $27,593.

For 12 months ending in June 30th, 1904, there were 153,266 tons of asphalten imported in the United States, valued at $514,297, against 120,544 tons imported in 12 months ending June 30, 1905, valued at $538,573.

HOLLOW CONCRETE BLOCK BUILDING CONSTRUCTION.

By SPENCER B. NEWBERRY

Copyrighted by Wm. Seafert, 1905.

Within the past five years a new building material, the hollow concrete block, has come rapidly into use, and the industry has grown almost as surprisingly as the manufacture of Portland Cement. Concrete building blocks were practically unknown in 1900, but it is probably safe to say that at present more than a thousand companies and individuals are engaged in their manufacture in the United States.

The cause of this remarkable development of a new material of construction is chiefly to be found in the rapidly failing supply of lumber, together with the widespread public interest in all applications of Portland cement. The advance of more than 50 per cent. in the price of lumber during the past few days has been a serious hardship and obstacle to the increasing multitude of people who aspire to having homes of their own, and it is but natural that builders should look about for some efficient substitute for wood, and should look with favor on a material which offers advantages of durability, safety, comfort and beauty which are unknown in frame construction.

There is good reason to believe that this efficient substitute for wood has been found in the hollow concrete block, and that we are still only on the threshold of the development of this building material. Opposition to its use on the part of the consumer is not to be feared; the obstacles to be overcome lie chiefly in the danger of careless or ignorant work by block-makers and builders, and in the need of study and invention to adopt the material to the economical production of convenient and beautiful structures. There is every reason why concrete should become the chief building material of the future. For large and costly buildings it is likely that solid concrete, plain or re-inforced, will have the preference. For smaller structures, especially factories and dwellings, hollow blocks are certainly cheaper, more suitable, and require much less technical skill in erection. The possibilities of this type of construction seem to be unlimited. Those who realize what *may* be done in this direction can hardly resist a feeling of impatience at the comparatively crude and clumsy work which has thus far generally been accomplished. All that is needed to secure an immense expansion of the concrete block industry is to improve the design of machines and product so as to make block construction simple, practical and beautiful. To accomplish this, ingenuity, invention and good taste will be required, and there is little doubt that these qualities, so characteristic of the American people, will in abundant measure be brought to bear upon the problem. The following suggestions on concrete blocks and their manufacture, by one who has had several years' experience in the business, are offered in the hope of contributing, to a slight extent, toward the progress which all who have faith in cement must have at heart.

Historical. The use of concrete for building construction dates back to the time of the Romans. Though their only cement was a mixture of volcanic scoria with slaked lime, they showed a degree of skill and boldness in the molding of walls, arches and domes which is scarcely equaled at the present day, and many of their structures still stand as striking examples of the everlasting qualities of artificial stone.

The molding of concrete into separate blocks, to be used for building in the same manner as brick or blocks of stone, appears first to have been introduced in the early part of the 19th century. Solid blocks were first made, but proved heavy to handle and found but scanty use. Hollow blocks to be used as such or filled up with concrete after placing in the walls, were patented by Sellars, in England, in 1875. Concrete facing slabs, with projections to secure them to the concrete filling, soon followed, and in 1878 Listh of Newcastle patented a very ingenious Z-shaped block, by the suitable placing of which hollow walls were produced.* All accounts indicate that these blocks were made by pouring wet concrete, and allowed to harden many hours before removing the molds, a somewhat costly and tedious process.

The modern rapid method of molding hollow concrete blocks, from semi-wet mixtures of such consistency as to permit immediate removal from the machine, is an American invention, and has been gradually developed during the past six years. By the use of this process the manufacture of blocks has been greatly simplified and cheapened.

Materials. Portland cement, owing to its uniformity, strength, and especially its promptness in hardening, is the only hydraulic material which finds any considerable use in block-making. A great point in favor of Portland cement is that it gains at least as great strength in air as in water; other hydraulic cements are generally unsuitable for work not kept permanently wet. At the present moderate price of Portland it is certainly cheaper in use, for a given strength, than any of its substitutes.

The "aggregate," or inert coarse material used with cement to produce concrete blocks, may be either sand and gravel or stone screenings. There is little choice between these two classes of material, if of good quality. Sand and gravel are generally cheaper, and are usually somewhat easier to perfectly mix with the cement. In the matter of strength and hardness of the resulting blocks there appears to be little or no difference.

The strength of concrete depends greatly on the density of the mixture, and this is chiefly a question of voids in the aggregate used. It is well known that a mixture of cement and sand is weaker than the same mixture with the addition of coarse gravel. For example, a mixture of cement 1, sand 3, will show a lower strength than cement 1, sand 3 and gravel 4, though the latter mixture contains only half as much cement as the former. This is due to the reduction of the voids in the mass by the addition of coarse gravel.

As an example of this, the writer made the following experiments on two samples of gravel:

	Wt. per cu. ft.	Pct. voids.
No. 1, sand and fine gravel.......	127.5 lbs.	22.9
No. 2, coarse gravel, nut to egg size	100.9 lbs.	38.9
Nos. 1 and 2, mixed, equal weights.	139.6 lbs.	15.5

Note the surprising increase in density on adding the coarse gravel. A concrete of cement with 6 parts of Nos 1 and 2 mixed would undoubtedly have shown as great strength as 1 of cement to 3½ parts of No. 1 alone.

A good indication of the value of gravel or stone screenings for concrete may be obtained by filling a cubic foot box with the material and weighing it. A solid block of one cubic foot of limestone or quartz, free from voids, would weigh 165 lbs. The amount by which a cubic foot of gravel or stone falls short of this weight represents the proportion of voids, or empty spaces, contained in it. For example, if a cubic foot of gravel weighs 130 lbs., the voids would be 35-165 of the total volume, or 21.2 per cent. A few trials will show that for best results the mixture must contain *a large proportion of coarse material.* Very few gravels will be found that are not improved by the addition of pebbles, and the greatest strength is obtained with material that contains comparatively little sand.

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*See Potter, "Concrete, its use in Building," Winchester, 1891.

There is, however, another consideration which enters into the selection of materials for block-concrete, and that is the appearance of the surface of the work. Unless a facing is used, a fair amount of fine material must be present to give the blocks an even surface. Nevertheless, it will be found that much coarser gravel or screenings may be used, with good results, than is generally supposed, and that the appearance of the work is not injured by the addition of a large proportion of coarse pebbles, up to about ¾ inch, while the strength and density are greatly improved by this addition. A one-to-five mixture of cement and gravel, containing at least 50 per cent. of pebbles remaining on an ⅛ inch screen, will be found better than a one-to-three mixture of cement and sand only.

As to the character of the sand and gravel to be used, there are many tests on record which show that rounded grains give greater density and strength than sharp irregular splinters, and that a small percentage of loam or clay does no harm providing the mixing with cement is thoroughly done.

Another material which may be used with advantage in block-concrete is *slaked lime*. In poor mixtures, as 1 to 4 and 1 to 5, the addition of lime improves the strength and lessens penetration of water; it also makes the blocks whiter on drying. It is possible, also, to replace part of the cement used, perhaps one-third, by slaked lime, without loss of strength. The most convenient form of lime for block-makers' use is the dry-slaked or "hydrate" lime, now a common article of commerce. At present prices, hydrate lime costs almost as much as Portland cement, and there is no great saving in using it. However, it forms a simple means of improving the appearance and water-resisting qualities of the work, and a few experiments will convince most block-makers that it is a valuable addition to the mixture.

Proportions.

Cement. The proportion of cement to be used will depend on the strength, appearance and impermeability desired. So far as strength is concerned, very poor mixtures, as one to seven or eight, may answer every requirement. Blocks made from such poor mixtures, however, absorb water like a sponge, and will not answer for the walls of dwellings, though they may perhaps be good enough for partitions, retaining walls, and buildings in which dampness is no objection. For dwellings, a poorer mixture than 1 to 5 is not to be recommended. Much depends, of course, on the character of the gravel or screenings employed. With properly graded gravel or screenings, containing a large proportion of coarse material, a 1 to 5 mixture will be found better than 1 to 3 with cement and sand only. The writer would recommend a mixture composed as follows, by measure:

Cement 1, hydrate lime ½, sand and gravel 6.

This is practically a 1 to 4 mixture, and will be found to possess fair water-proof qualities, sufficient at least for dwellings which are to be furred and lathed. If plastering is to be applied directly to the inside surface of the walls it is necessary that the blocks shall absorb water only very slowly, so as to be only practically penetrated during a long-continued rain. Such a result can be reached by giving the blocks a facing of richer material, perhaps 1 to 2, or by using a sufficiently rich mixture for the whole body of the blocks, such as:

Cement 1½, hydrate lime ½, sand and gravel 5, or
Cement 1, hydrate lime 1, sand and gravel 5.

These should be effective with gravel or screenings of suitable character. The block-maker should experiment with the materials at his disposal, and thus ascertain what proportions are suitable for the special purposes he may have in view.

Another method of producing water-tight blocks, which is effective with mixtures as poor as 1 to 6, is by the use of a special water-proof compound, invented by the writer, particulars of which will be furnished on application.

Water. The use of a proper amount of water is essential to good work, and in this respect many block-makers are extremely careless. It is well known that a fairly wet concrete is far better than a dry one, and that too much water is better than too little. A rather dry mixture may be more convenient to use, and may enable the maker to turn out a larger number of blocks in a day, but the resulting work will always be porous, weak and crumbling. On the other hand, the extravagant claims made for the wet process, in which the concrete is poured into the molds and left for many hours to harden, are, according to the writer's experience, chiefly imaginary. It is perfectly practicable to produce concrete of the highest possible quality and still to remove the blocks at once from the moulds. The mixture must be *as wet as it can be made without sticking to the plates*, and without sagging or becoming distorted when taken from the machine. Blocks so made will be found at least equal in strength and hardness to any that can be made by pouring. They are also much more attractive in appearance, showing a rich, sandstone-like surface, instead of the dull, lifeless look which the wet process gives. As compared with blocks made from too dry a mixture, they are lighter in color, denser, stronger and more impermeable.

The correct percentage of water varies with the materials, but is generally from 8 to 9 per cent. of the mixture, by weight. It will be found that a mixture containing much coarse gravel or stone may be made much wetter, without sagging or sticking, than one of finer material.

Manufacture.

Mixing. The materials, carefully measured, should be thoroughly mixed dry, then the proper amount of water added and the mixing continued. Thoroughness in this part of the operation will be found to pay for itself many times in improved work. Uneven color or blocks results from imperfect mixing, and especially from varying the proportion of water. Use of a good concrete-mixer is far preferable to mixing by hand, both in saving of time and labor and in thoroughness of work done. Hand mixing, by the use of a hoe, must be vigorous and long-continued, or the full effect of the cement used will not be obtained. The inferior work of many small-scale block makers is largely due to this cause.

For the preparation of concrete for blocks, in which thorough mixing and use of an exact and uniform proportion of water are necessary, *continuous* mixing machines are unsuitable, and *batch mixers,* in which a measured batch of the materials is mixed the required time and then discharged, are the only type which will be found effective. The writer prefers a batch mixer of the intermittent pug-mill type, with hinged bottom discharge, as made by the Drake Concrete Machinery Co. of Chicago. If such a machine is purchased, extensible mixing arms of chilled iron, capable of being lengthened as the ends become worn, should be insisted upon. Another machine which the writer has seen in successful use is the revolving pan mixer with central discharge, made by the Elliott & Walker Co. of Wilmington, Del.

Block Machines. There are a multitude of machines on the market, and new advertisements appear in every issue of the cement journals. From this we may well believe that money is more easily made by the sale of machines than by their use in block manufacture. Practically all the machines offered are repetitions of the same fundamental design, and differ only in minor mechanical details. A discussion of relative merits and expression of preference would be useless. Each intending purchaser should study the various machines offered and select that best adapted to his needs, giving preference to those of solid and substantial construction, and taking care that he gets real value rather than "blue sky" for his good money.

Block machines may be generally divided into two groups: those with horizontal and with vertical cores. The former are usually considered the more convenient for making "faced" blocks, though a facing can be put on with either type of machine. The use of a facing of finer, richer or colored mixture must be called a matter of taste. In the judgment of the writer it does not pay to use a facing, as the additional labor and preparation of a separate mixture cost more than to make the whole block of suitable composition to give a good surface. If the facing differs much from the body in composition, also, it is likely not to adhere perfectly, and trouble has been experienced from this cause. However, for waterproof and colored work a facing may be found an advantage, and doubtless many will give preference to a machine which allows this to be conveniently applied.

Machines are provided with face-plates for the production of rock-faced, tool-faced and plain blocks, and various ornamental designs, for borders and friezes, are also furnished. Plates for rock-faced blocks should always be cast from a *natural stone*, and several different patterns of each size should be obtained, to avoid monotony in appearance of the work. Many machines are provided with rock-face plates evidently cast from some moulded soft material, which yield blocks with a surface more like that of pats of butter than natural stone. Such makeshifts are abominable, and a fraud on the purchaser.

As to size of blocks, most machine-makers appear to have adopted the standard dimensions of 32 inches in length by 9 inches in height, giving two square feet of face to each block. Machines are generally made for blocks, 8, 10 or 12 inches in thickness. Some machines are adjustable to allow blocks of either thickness to be made. Where the business will warrant it, however, it saves time to have a machine for each size. An 8-inch wall is abundantly strong for foundations or walls of 2-story dwellings, but in many cities the building code prohibits anything less than 12-inch walls for foundation and first story. There seems to be only small demand for the 10-inch block.

Machines are generally provided with attachments for making corner blocks. Arrangements for making 45 degree and 30 degree angle blocks, for bays and towers, are also desirable.

Tamping. This is generally done by hand, by means of iron rammers. Some well-equipped plants use pneumatic tampers, operated by compressed air, with considerable economy in labor and probably some improvement in density. Excellent results can, however, be obtained by hand-tamping, if the mixture is wet enough.

Sticking to the plates may be largely prevented by rubbing the inside surface, when dry, with paraffine, animal or vegetable oil, or soft soap. Mineral oils, such as common lubricating oil, are less effective.

Handling, Hardening and Storage. For good results, blocks must be kept under roof, protected from sun and wind, and frequently sprinkled, for at least 5 days, and preferably for 7 days. They may then be piled up outside, and in dry weather should be kept moist by occasional sprinkling with hose for at least three weeks more. Blocks should never be built into a wall until at least 4 weeks old. Freshly-made blocks will be found to shrink more than 1-16 inch in length on seasoning a month, and if put into a building when only a few days old will develop unsightly cracks in the joints or through the blocks themselves.

In handling blocks from the machines the use of three-decked cars on tracks will be found a great saving in time and labor. In a factory so equipped, each machine, with two men tamping and one shoveling, will easily make 150 blocks, 32 inches long and 8 inches wide, in 10 hours.

Properties of Blocks.

Strength. Well made Portland cement concrete, of good sand and gravel or limestone screenings, 1 to 5, will have a compression strength at 4 weeks of over 2,000 lbs. per square inch, and at 1 year of over 3,000 lbs. Tests of various mixtures, in 3-inch cubes, at the Case School of Science in Cleveland, showed the following:

COMPRESSION STRENGTH AT SIX WEEKS.

	Strength, lbs. per sq. in.	Specific Gravity.	Water Absorption, per cent.
Cement .... 1½ Sand and gravel........... 6	3,200	2 17	4.16
Cement .... 1½ Hydrate lime. ...... ½ Sand and gravel 6	3,880	2 18	4 10
Cement . ... 1½ Limestone creenings. ....6 (Poured in porous mold)	2,000	2.05	5.04

It is very difficult to obtain reliable crushing tests of actual hollow blocks, owing to the difficulty of applying the load uniformly over the whole surface. Three one-quarter blocks, 8 inches long, 8 inches wide and 9 inches high, 10 weeks old, made of cement 1¼, lime ½, sand and gravel or stone screenings. There is little choice

	Net area.	Max. load.	Stress per sq. in.
1.	49.7 sq.in.	99,700 lbs.	2,000 lbs.
2.	49.7 sq. in.	89,800 lbs.	1,805 lbs.
3.	49.7 sq. in.	76,200 lbs.	1,530 lbs.

Two blocks, 6x8x9 inches, 22 months old, showed a crushing strength of 2,530 and 2,610 lbs. per sq. inch.

Now a block 8 inches wide and 32 inches long weighs 120 lbs., and has a surface of 174 square inches. Assuming a crushing strength of 2,000 lbs. per square inch, we find by calculation that 2,900 blocks could be piled one upon another before the lowest would give away, making a total height of 2,175 ft. Allowing a factor of safety of 5, a height of 435 ft. would be admissable. This shows how greatly the strength of concrete blocks exceeds any demands which could possibly be made upon it. As stated above, if it were not for the question of water absorption, much poorer mixtures than are generally used would give abundant strength. Where water-proof qualities are no object, and good gravel, containing plenty of coarse pebbles, is to be had, mixtures as poor as 1 to 8 or 1 to 10 will often be found to answer. The following table of tests of various mixtures, made by the writer, shows the good results that can be obtained with low proportions of cement, especially with the addition of hydrate lime. It should be remembered that the compression strength of concrete is generally about ten times its tensile strength. The water absorption

PROPORTIONS BY WEIGHT.	Tensile Strength. 22 Days.	Weight Per Cu. Ft. Pounds.	Water Absorption.	Cost of Materials for 8-in. Block.
Cement .... 150 Hyd. Lime .... 0 Sand ....:...........600	334	130.0	7.72	11.2 Cts.
Cement .. ..125 Hyd. Lime .... 25 Sand 600	360	136.4	5.75	10.6 Cts.
Cement....................100 Hyd. Lime................ 50 Sand.... 600	278	139.5	5.23	10.0 Cts.
Cement....................100 Hyd. Lime................ 25 Sand 600	197	136.0	5.75	9.0 Cts.
Cement.................... 50 Hyd. Lime......... .... 50 Sand ... .600	182	132.6	7.03	6.7 Cts.

given is the per cent. of water, by weight, which the dry block absorbed after soaking 24 hrs. The tensile strengths are the average of 4 briquettes each. The sand used was a coarse bank sand, containing very little gravel. The cost of material is based on assumed price of $1.50 per barrel for cement, $5 per ton for hydrate lime, and 25c per ton for sand, and is stated in cents per 8-inch block, 32 inches long.

It will be noted that the hydrate lime considerably decreases the water absorption, and in small proportions increases the strength. The last mixture, 1 to 1 to 12, appears strong enough for all practical purposes, and is actually less permeable than the first, consisting of cement and sand, 1 to 4, without lime. It is evident that in the vast sections of our country in which sand and gravel are to be had, almost without cost, in unlimited quantities, concrete blocks made from such a mixture would be far cheaper than lumber, and ought easily to replace all other building materials. All that is needed to bring this about is practical demonstration, and the requisite skill and ingenuity on the part of architects and builders. It is conceivable that a type of construction for small dwellings, using a 4-inch or 5-inch hollow block, might easily be developed, and these could be turned out, two at a time, on 8-inch or 10-inch machines, provided with suitable cores and partition. The possibilities of development in this direction seem almost limitless.

Design A. W. M. Kingsley, Architect, Six-Room Concrete Block House.

Water Absorption.

One of the chief faults often observed in work done with concrete blocks is their tendency to absorb water to such an extent as to cause dampness to appear on the interior surface. This is especially noticeable in blocks poor in cement and made too dry. The fault may be overcome by use of suitable materials and sufficient care in manufacture.

The terms "porosity" and "permeability" are often used, and by many supposed to be of the same meaning. The porosity of concrete is, however, the proportion of voids, or empty spaces, which it contains, while the permeability is the rate of speed with which water, under a certain pressure, will pass through it. All concretes and mortars are more or less porous, and all are somewhat permeable by water under heavy pressure. It is well known that, with the same proportion of cement, mixtures of fine sand are more porous than those of coarse sand. The latter are, however, much more permeable than the former. Feret has shown that the porosity is the total amount of voids contained in the mass, while the permeability depends on the size of the individual openings. The least porous concrete may, therefore, be the most permeable, and vice versa. If, however, both fine and coarse grains are present in proper proportion, the mass will show the least porosity and at the same time be the least permeable. The concrete which best resists water will therefore be that which is most dense, provided a sufficient amount of fine grains are present.

If a concrete block be immersed in water it will gradually absorb the liquid, and in time the amount of water taken up will be nearly equal to the total of voids present. The rapidity with which this absorption takes place will differ greatly, however, with different mixtures of the same porosity; blocks containing fine material in the right proportion will be found to absorb water much more slowly than those made from coarse materials only. It is the *speed* with which the water is absorbed that is of consequence in the case of concrete blocks, rather than the total amount which will be taken up after a long time. If the absorption is slow, the moisture during a long-continued rain will penetrate only partially through the block, and will dry out again before the surface is again wetted. Perfectly water-proof walls are not necessary, and are even objectionable, owing to their tendency to "sweat" from the deposition of moisture on the inside surface. For health and dryness it is necessary that a gradual circulation of air through the walls should take place, and that any moisture condensing on the inside shall be absorbed and carried away.

Sufficient impermeability for practical purposes, to avoid all danger of dampness penetrating from the outside, may be secured by use of

Sufficiently large proportion of cement,

Addition of hydrate lime,

Suitable sand and gravel or screenings, containing both fine and coarse material.

With poorer mixtures, which would otherwise be too absorbent for use in the walls of dwellings, any desired water-proof qualities may be secured by the addition of a very small percentage of water-proof compound, as already explained.

Color, Etc.

The experience of the writer has been that the natural stone color, obtained by the use of ordinary sand and gravel or screenings, is more popular with purchasers of blocks than any tint which may be given by addition of pigments to the mixture. Limestone screenings give a lighter color than most kinds of sand, but the color is chiefly determined by the cement used, and the tint obtained with white sand is very little lighter than that with sand of ordinary gray shade. The addition of hydrate lime makes the blocks decidedly lighter in color, and the same result is obtained, in still greater degree, by making the mixture as wet as possible. The difference between blocks made fairly wet and those made too dry will be found to be very striking.

Colored blocks, imitating various tints of natural stone, may be obtained by a facing of richer mixture to which from one to three per cent. of dry mineral color has been added. The colors most suitable are

Red iron ore paint or Venetian red,
Yellow ochre,
Ultramarine blue,
Ultramarine green.

Design B, W. M. Kingsley, Architect, Eight-Room Concrete Block House.

These colors are inexpensive, and may be mixed to any desired shade. It must be remembered that all cement work bleaches and whitens decidedly on hardening and drying. The color of the freshly-made blocks must therefore be much deeper than it will appear after a few weeks' exposure to weather. Deep and strong colors are, in fact, difficult to secure in cement work.

Cost and Selling Price.

The average weight of hollow concrete blocks, 9 inches high and 32 inches long, in which the cores or openings are one-third the total volume, is as follows:

8 inches wide, 120 lbs.
10 inches wide, 150 lbs.
12 inches wide, 180 lbs.

These weights will vary somewhat with the materials and proportions, blocks rich in cement or with the addition of hydrate lime being somewhat heavier, and those made from poorer mixtures somewhat lighter, than above stated. Limestone screenings generally give blocks somewhat lighter in weight than sand and gravel.

If we assume the following costs of materials,

Cement, $1.50 per bbl., equals	40c per 100 lbs.
Hyd. lime, $5.00 per ton, equals	25c per 100 lbs.
Sand and gravel or screenings, 25c per ton, equals	1.2c per 100 lbs.

and that these are mixed in batches of 750 lbs. each, sufficient for 6 8-inch or 4 12-inch blocks, the cost of materials per batch and per block, for two representative mixtures, will be approximately as follows:

Cement, 150 lbs., equals	60c
Sand, etc., 600 lbs., equals	7.5c
Total	67.5c
For each 8-inch block	11.2c
For each 12-inch block	16.9c
Cement, 100 lbs., equals	40c
Hyd. lime, 50 lbs, equals	12.5c
Sand, etc., 600 lbs., equals	7.5c
Total	60.0c
For each 8-inch block	10c
For each 12-inch block	15c

The labor cost will depend greatly on the capacity and equipment of the factory. Three men on one machine, with mixed material delivered to them, will make and place on cars 150 8-inch or 125 12-inch blocks per day of 10 hours. In addition there will be required the labor of unloading and handling cement, lime and sand or screenings, operating engine or motor and concrete mixer, pushing cars, uploading, piling and sprinkling blocks, loading on wagons for delivery, and superintendence. In general it may be said that a factory producing the equivalent of 600 8-inch blocks per day will require a force of about 25 men, at probable average wages of $1.80 per day. Other necessary expenses are power, water, management, sales, advertising, office rent and supplies, repairs, etc. A fair estimate of the daily expenses of such a factory would be:

Materials, 600 blocks at 10c	$60.00
Labor, 25 at $1.80	45.00
Repairs	10.00
Office and misc. expenses	20.00
Total	$135.00

or 22.5c per 8-inch block. With a fair margin for interest on capital and reasonable profit, 8-inch and 12-inch blocks, of first-rate quality, may be sold at price of 30c and 40c each, respectively, at factory. Many country block makers get higher prices than these, especially in regions where stone and brick are costly, but in large cities it will be found necessary, in order to maintain an extensive business, to compete at equal price with the common building materials, such as brick and rubblestone. This can be done at the selling prices above stated.

For example, common red brick are laid in the wall in the central cities for about $12.00 per thousand. At 24 brick to the cubic foot, one thousand brick will make 41.7 cubic feet of wall, or at $12.00 per M., 29c per cubic foot. Now, good wages can be earned by laying 12-inch blocks at 5c each, but the price ordinarily charged by contractors is about 10 cents each. With blocks selling at 40 cents at factory, and adding 5 cents for teaming and 10 cents for laying, 12-inch blocks, laid, making 2 cubic feet of wall each, would cost 55 cents, or 27.5 cents per cubic foot. Of course, common brick are used only for the roughest purposes, and for residences or business buildings are given facing of pressed brick, costing $25.00 to $30.00 per thousand, laid. This runs the cost of brick construction up to almost twice that of concrete blocks. As for stone, its cost is practically prohibitive except in cases where expense is not an important consideration. The writer was quoted $2.00 each on rock-faced solid blocks of natural sandstone, at Cleveland, of the same size and shape as the 8-inch concrete blocks selling at 30 cents each.

Those who can make blocks for their own use, as at large factories where much building is done, can make and lay them at a cost far below that above stated. Laborers can be put to work making blocks not otherwise employed, and a stock thus constantly kept in readiness, at localities where sand and gravel are to be had for the cost of hauling, 8-inch blocks of 1 1-3 cubic feet can be made at a cost of 15 cents each and laid up for 5 cents more, making total cost of wall of 15 cents per cubic foot, or about half that of common brick. The convenience, durability, beauty and economy of this type of construction, for industrial purposes, is so great that no manufacturer who has made trial of it will ever want to use anything else in making additions to his works.

Use of Blocks in Building.

From the foregoing it is evident that no other building material compares in cheapness and practical usefulness with hollow concrete block. By their use, buildings having all the advantages of natural stone, substantial, comfortable, safe and everlasting, costing nothing for repairs, may be built at about the same cost as dangerous, uncomfortable and perishable frame structures. Why, then, is any other material used, and why do we not see thousands of concrete block dwellings springing up in our cities? The answer to this question is to be found in the ugly and unattractive character of most of the block buildings thus far erected. Something more than a good building material is needed to make an inviting dwelling, pleasing to the eye and a pride to the owner. The chief fault of block structures is monotony. A square house made of four block walls, with blocks all of the same size and made from the same mould, windows equally spaced, and the same everlasting blocks used for piazza posts and perhaps perched on the roof to form an open-work cornice, reminds one of the houses children build from the wood blocks of the nursery. What is needed is variety and artistic design. No other material is so capable of this as concrete, for blocks of any pattern and shape, also columns, capitals, cornices, friezes—all these can be turned out by the million at a trifling cost, if architects will only tell us what make. There are multitudes of people about to build who would adopt concrete blocks without a moment's hesitation if they could see something tolerable in the way of design. Here the block industry is under a heavy handicap. Architects are slow to take up a new material and study its capabilities, and to change their habitual styles of design to suit its requirements. Domestic architecture *in stone* is a branch of art which has been but slightly developed in any country, and yet its possibilities seem to be unlimited. It is, of course, only a question of time when many architects will see the opportunity which this material offers and the advantage to be gained by making a specialty of this new type of construction. Without their assistance the block-maker is helpless, and the growth of his business must be slow. Perhaps it may be in the artistic utilization of concrete, both in block and monolithic form, that the source of a true American style of architecture may be found.

As an example of the kind of work which must be done to give to concrete block construction the popularity which it deserves, the following perspective views of two dwellings, designed for the Cleveland Concrete Building Block Co. by Mr. W. M. Kingsley, architect, are here given:

Design A represents a 6-room house, estimated cost $2,100. The concrete work includes 18-inch footing, 12-inch basement walls 7 feet high, 8-inch walls of first floor, concrete columns and porch piers.

Design B represents an 8-room house, estimated cost $4,350. Concrete work includes 18-inch footing, 12-inch basement walls, 8-inch walls of first and second floors, concrete columns and porch piers.

AUTOMOBILES FOR BUSINESS.

The Horseless Age, the pioneer automobile publication in the United States, devotes its issue of July 5 to a thorough treatment of The Automobile for Commercial Purposes from the business standpoint purely. The edition comprises over 150 pages and the reader will be surprised at the array of trucks, buses and delivery wagons that are reproduced in its columns, convincing the most skeptical that the horseless age is at last dawning for the poor work horse, as well as for the roadster. Business men in all branches of trade will find in a perusal of its pages much food for thought. Experiences of those who have been using automobiles for trucking, delivery and carrying passengers are freely and truthfully given, together with practical points on the engineering problems involved, so that any prospective buyer of business automobiles may be carefully guided in the selection of the proper vehicles for his particular work.

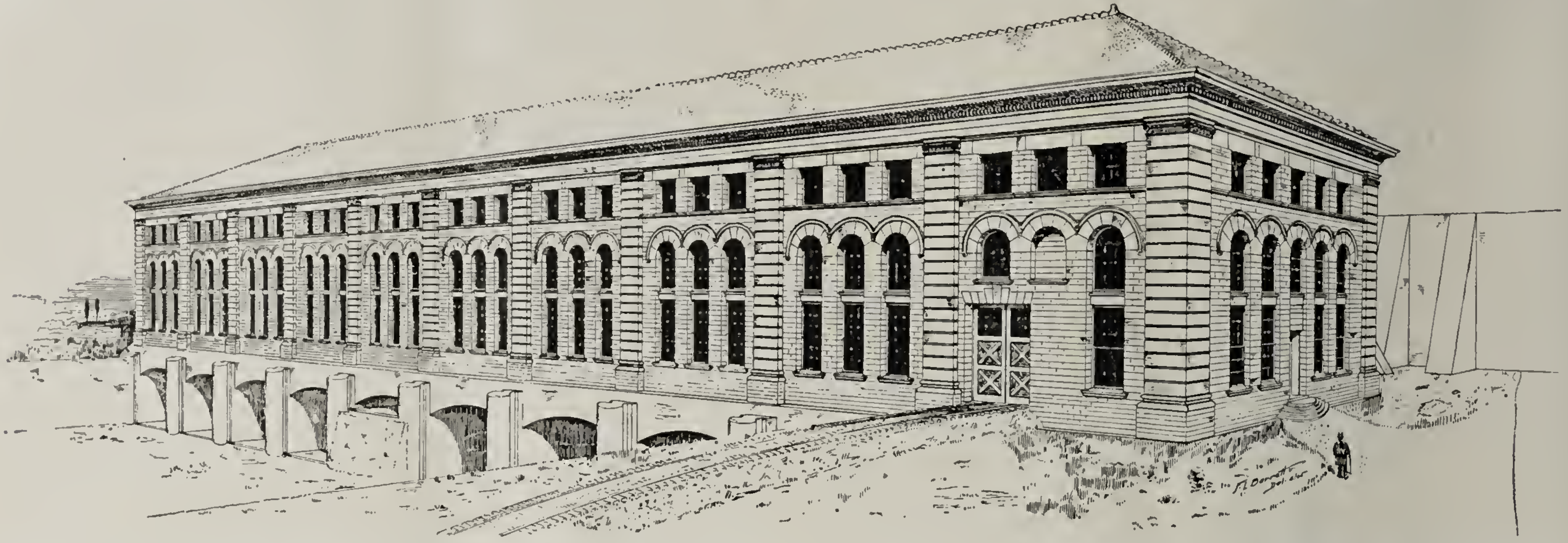
Published by The Horseless Age, price 10 cents. 9-11 Murray Street, New York.

A new rate on cement from Puget Sound terminals to points in Washington & Columbia River Ry. and Oregon and Idaho points is 25 cents per 100 pounds on 25-ton lots, effective August 1st. F. T. Crowe & Co., of Tacoma, Washington, have filed a protest against this rate as favoring Spokane against Tacoma.

SANTA CRUZ PORTLAND CEMENT CO.

A special meeting of the stockholders of the Santa Cruz Portland Cement Company will be held on August 3d, at San Francisco, to vote on the proposition to issue $2,000,000 bonds. The Company was organized June 27, 1905, with $5,000,000 authorized capital stock. It will build a cement plant at Sandince Creek, 12 miles from Santa Cruz.

CONCRETE BLOCK POWER HOUSE AT LOCKPORT, ILL.

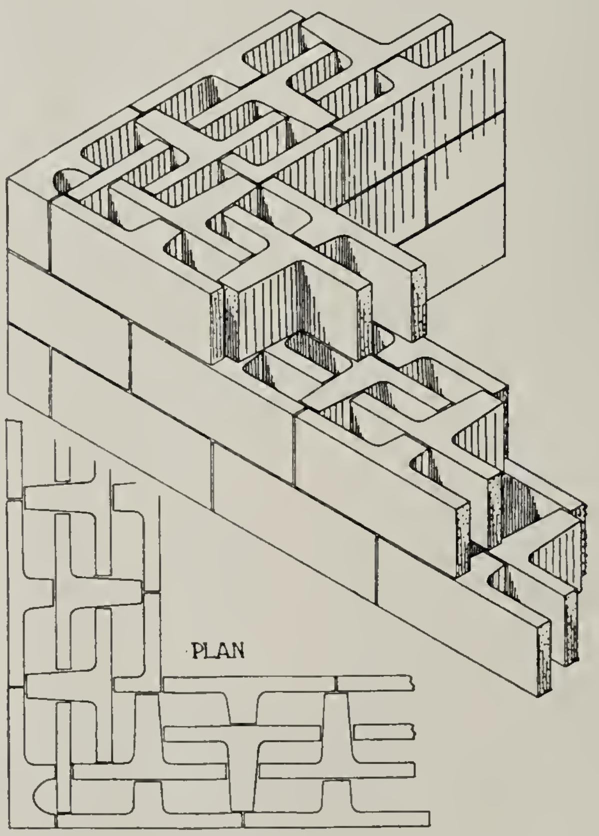


Power House for the Sanitary District of Chicago at Lockport, Ill., 386 by 160 Feet and 47 Feet High, Constructed of Waterproofed Concrete Building Blocks. Isham Randolph, Chief Engineer; Geo. M. Wisnor, Assistant Chief Engineer, Sanitary District of Chicago.

The trustees of the sanitary district of Chicago have under construction a two-piece concrete block structure to be used as a power house for the Lockport power development on the extension of the main drainage channel on water power section 2, in Township of Lockport, Will County, Ill. The structure will be 160 feet wide, 386 feet long, and 100 feet high. It is to contain nine turbine chambers, bulk heads designed for a working head of 34 feet of water; a generator room, 62 feet by 359 feet, and offices, 20 feet by 62 feet. The foundations, bulkheads, turbine chambers, tail pits and draft tubes are concrete, tamped in place in ridged forms built of plank of uniform thickness, the inner sides of which to be smooth, to produce a good finished facing. The specifications call for mixing in a machine approved by the engineer.

The concrete used is of three grades: No. 1 to consist of 1 part cement, 2½ limestone screenings or sand, at the discretion of the engineer, and 4½ parts broken stone, of which 7,500 cubic yards were required; No. 2 mixture, 1 part cement, 3 parts screenings, and 6 parts broken stone, of which 3,500 cubic yards were used; No. 3 mixture, 1 part cement, 3 parts screenings, and 9 parts broken stone, of which 1,000 cubic yards were specified, and 2,260 square yards of granolithic floors. The concrete was all mixed by the batch method and immediately deposited in the work, in layers not over 6 inches thick, each layer to be thoroughly tamped, no retamping allowed; all anchor bolts must be set in mortar of the quality specified, the concrete to be kept wet for 7 days after it is in place.

The concrete blocks used in the side walls and partitions are of the American Hydraulic Stone Company's 2-piece pattern, the air space allowed being between 30 and 50 per cent of the total volume of the concrete and air. The exposed faces of the blocks are to have smooth surfaces similar to rubbed faces of Ashlar Masonry. This is to be accomplished by using a facing ¼ of an inch thick or Densitor Waterproofing mortar, composed of 20 pounds of Densitor Waterproofing to each barrel of Vulcanite Portland Cement, the Densitor and the cement to be ground together and mixed, 1 part Densitor waterproofed cement and 2 parts of sand; the waterproof cement to pass all the usual tests for soundness, including the boiling and freezing tests; the concrete blocks to be true in shape, with clean arrises. They are to be of such design that at least 50 per cent of the wall shall be concrete. The blocks of the exposed surfaces shall overlap or break joint at least the depth of the course, a ¼-inch joint, well filled with Portland cement mortar, mixed 1 to 2, being required. The workmanship is to equal that of first-class Ashlar Masonry. The blocks in the cornices, caps, bases, capitals, window, door, ornaments, etc., to have sharp and well-formed edges, and anchors are to be provided to hold them securely in place.



American Hydraulic Stone Co., Two-Pound Concrete Building Block.

About 70,000 American Hydraulic Stone Company's two-piece building blocks will be required in the walls of the structure. Both the inner and outer face of these blocks will be waterproofed with Densitor Waterproofing, furnished by the Densitor Co., 228 La Salle St., Chicago, Ill. The concrete blocks will form the finish for the walls and partitions, inside and out, throughout the building. The finish of these blocks resembles Bedford stone, showing a fine grain, as well as a hard, dense surface that sheds water like glass or marble. Hays Brothers of Joliet, Ill., are the contractors for the superstructure. Isham Randolph, chief engineer, and George M. Wisner, assistant chief engineer.

The United States Civil Service Commission announces examinations for architectural and structural draftsmen for the Quartermaster's Department, salary $1,500 per annum. Examinations for construction engineers for sewers and waterworks for the Philippine service, salary $1,400 to $2,000 per annum. Both examinations can be taken Sept. 13-14 at 198 different points in the United States as well as at San Juan, Porto Rico. Applications for blanks and other information should be addressed to the United States Civil Service Commission, Washington, D. C.

The property of the National Portland Cement Co., located at Martins Creek, eight miles up the Delaware from here, was sold by the sheriff to A. E. Gerstel.

JEFFREY BELT CONVEYOR.

The accompanying illustration shows a very interesting Jeffrey Belt Conveyor recently installed by the Logan Brick Manufacturing Company of Logan, Ohio. This conveyor is used for the purpose of removing several feet of stripping (top soil and impure clay) to a refuse dump on the opposite side of the track, and has been in operation long enough to demonstrate to the entire satisfaction of the purchaser its efficiency and economy.

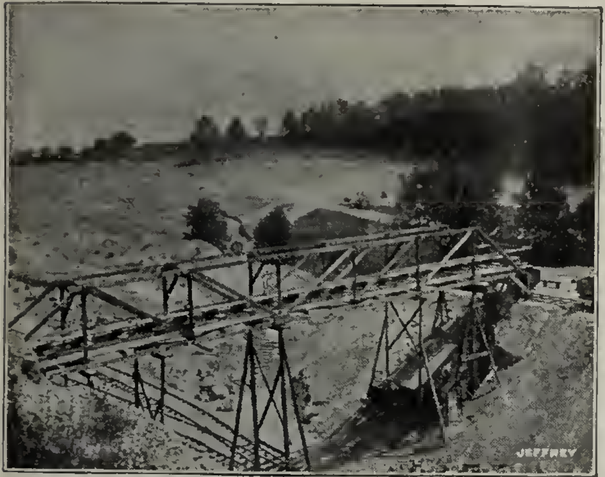


Fig. 1.

The conveyor proper consists of a belt 20 inches wide, and the material is carried a distance of about one hundred feet. The conveyor is mounted on a portable wooden truss, Fig. 1, while Fig. 2 shows the belt mounted on the truss; it has a capacity of 60 to 70 tons per hour, and is operated by a six-horsepower gasoline engine, mounted on the same frame. This engine, however, is much larger than actually needed, being put in for future extension. With this method of stripping, the work can be done a great deal cheaper and quicker, and the arrangement might appeal to others who have similar work.

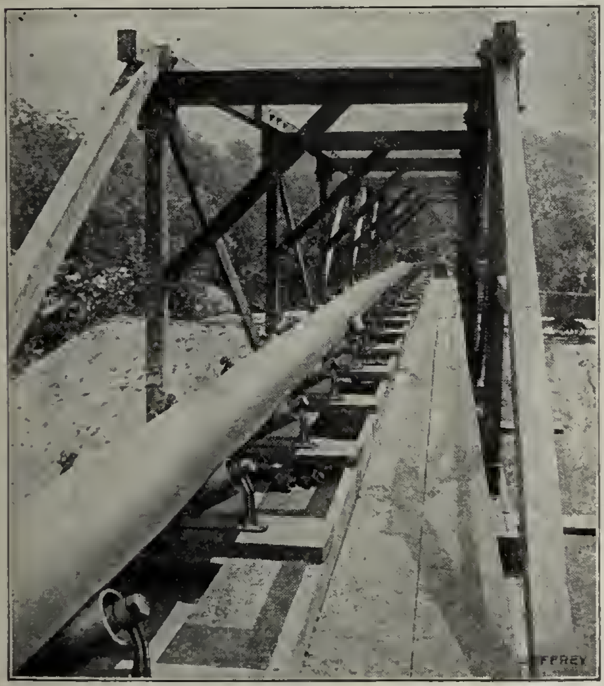


Fig. 2.

The machinery and equipment is furnished by the Jeffrey Manufacturing Company of Columbus, Ohio, who make all types of elevating and conveying machinery, and will be glad to correspond with interested parties.

This company also maintains branch offices at New York City, Chicago, Denver, St. Louis, Boston, and numerous special agencies for the convenience of prospective purchasers.

BURT PORTLAND CEMENT WORKS.

The Burt Portland Cement Plant is located near Bellvue, Eaton county, Michigan, and was designed and erected by O. Button for W. R. Burt of Saginaw, Michigan, who has alone financed the entire enterprise. There is no incorporated company.

The raw materials from which cement is manufactured consist of a shaley, calcite rock, carrying about two-thirds of the required clay. The additional quantity of clay required to make the proper raw mix is taken from a blue shale deposit lying below the calcite deposit. Both the calcite-shale and the blue shale are excavated with a powerful steam shovel built for this class of work. No blasting of the calcite-shale rock being required, the rock and shale are crushed to pass a one-inch mesh at the quarry, where the crushing plant is located. The crushed materials are next elevated to dryers located between the kiln stacks where they are dryed by waste heat from the rotaries. After drying, the mixed shale and rock is ground to twenty mesh and conveyed into large concrete storage bins. The material in these bins may be a few per cent high or low in lime. From these bins the material is drawn through suitable feeders and exactly proportioned to form the correct raw cement compound, which is next passed through a continuous mixer on the way to the tube mills, where it is ground and ready to be fed into the rotary kilns, where it is clinkered. The hot clinker is taken away by a large pivoted, gravity-bucket conveyor, and stored on a large paved area out of doors, which constitutes the clinker storage room, and will accommodate four or five months run of clinker.

The clinker is conveyed to steel bins in the grinding room by underground conveyors and fed into the mills. The finished cement is delivered into reinforced concrete stock bins ready for packing into bags and barrels to fill orders.

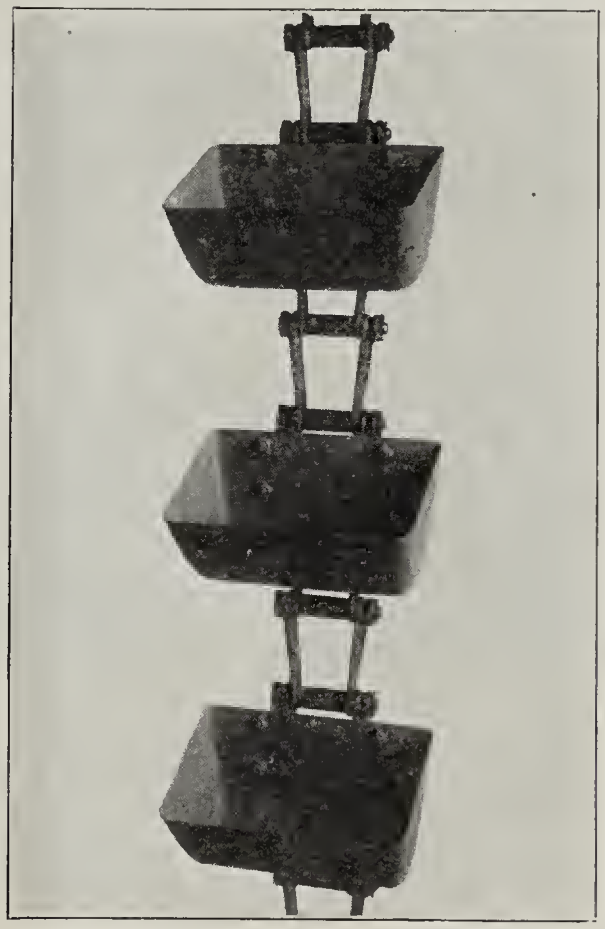
The power for the plant is furnished by compound condensing engines and alternating current generators and induction motors, every machine having its motor geared direct, thus eliminating the shafting and belting to a great extent. Mr. Button has installed a system of powdered coal burning in the boiler house. The system permits of the use of the waste boiler heat for drying coal, without in any way interfering with the draught or economical running of the boilers.

The plant which is now operating has an average daily capacity of 1,600 barrels of cement a day.

The Reinforced Concrete Chimney at this plant is 182 feet high with an inside diameter of 8 feet and was built by the Weber Steel-Concrete Chimney Company of 161 LaSalle St., Chicago, Ill.

PRESSED STEEL ELEVATOR BUCKETS.

The Link-Belt Engineer Company, of Philadelphia, is using pressed steel in the manufacture of elevator buckets. The new buckets, made in one piece, free from seams and rough surfaces, are from 20 to 40 per cent lighter than malleable iron buckets of corresponding sizes. The accompanying illustration shows the uniformity of gauge and the symmetrical design. The superiority of the new pressed steel buckets over cast buckets is obvious—compact and light, they obviate the destructive wear on chain and sprocket wheels and prolong the life of the elevator, a factor of importance to the users of this class of machinery. Where cement, sand, grain, coal, gravel and materials of a like nature are to be handled, the use of these buckets should prove materially advantageous. Users of japanned or galvanized buckets will recognize the superior qualities of pressed steel in the service demanded by the conditions that exact special surfaces in conveying buckets.



The Bancroft Cement Block factory at Bancroft, Iowa, is making 16 different sized blocks.

NEWS ITEMS.

Instructions for Manufacturing Concrete Building Blocks. The Marquette Cement Mfg. Co., offices 1513-14 Marquette Building Chicago, has published a leaflet covering the above subject which will be sent to persons interested on request to the above address.

Prof. G. P. Grimsley, Assistant State Geologist of West Virginia, has been investigating the cement resources of the state and has located numerous deposits of lime stone in Berkeley and Jefferson counties with suitable shale deposits near at hand; water power and coal available. A report has been made to the industrial department of the B. & O. Ry covering the details of Prof. Grimsley's investigations.

Farewell Reception Tendered to General Oyama at Tokyo, on His Departure for the Front to Asume Chief Command of the Japanese Forces in the Field. General Oyama Is the Ninth Person From the Left in the First Line. The Groupe Contains the Cabinet Officers, Prince, Admirals and Generals of the Army.

The Hill Clutch Co., of Cleveland, O., has commenced suit in the Circuit Court at Ann Arbor, Mich., against the White Portland Cement Co. to enforce a mechanic lieu for $1,252 for machinery. The Metropolitan Trust Co. of Buffalo, and the Buffalo Forge Co. and C. D. Kotcher are named as defendants, all of the last named defendants being creditors of the Cement Co.

At a stockholders' and directors' meeting of the Niagara Cement Company the company was organized by the election of the following officers: William B. Ruggles of New York, president; John P. Seymour of New York, vice-president and general manager; William B. Reading, treasurer; C. A. Collins, secretary.

The board of directors looked over the property upon which the mill is to be located and decided to take four acres instead of three as originally intended. George A. Ricker was employed to make the necessary surveys at once.

An accident at the Edison Portland Cement plant on August 3d resulted in the death of Horotz Janos, who was killed while attempting to rescue the foreman, who was standing in a cement bin into which cement was being discharged. Janos fell into the bin backwards and was covered with several feet of cement in an instant. It required two hours to recover the body. Janos was 18 years old.

The White Portland Cement Company's power house was destroyed by fire, loss $3,500. The works are located at Four Mile Lake, east of Chelsea, Mich.

The Bonnot Co. of Canton, Ohio, has sued the International Portland Cement Co. for $2,249 for machinery furnished the defendant.

The Iola Portland Cement Company will erect an addition to the present plant.

The Chanute, Kansas, Tribune notes the arrival of J. R. Patterson of Union City, Mich., and states that Mr. Patterson is arranging to commence work on his new Kansas Portland Cement plant. The company's gas land holdings are to be developed by sinking gas wells. Work on the proposed plant is to start during the summer.

The City of Minneapolis will equip a complete cement testing laboratory under the supervision of J. G. Houghton, of the city building inspection department.

Carolina Portland Cement Company will probably erect a Portland cement plant in the Birmingham, Ala., district. J. Ross Hanahan, president.

Walter Friedlander, of the Day and Night Tobacco Co., of Cincinnati, O., will erect a re-inforced concrete tobacco factory, six stories high, on Carlyle avenue, near Baymiller street.

The Diamond Rubber Co. of Akron, O., has issued a small illuminated pamphlet describing the various mechanical rubber products, as well as a concise history of the company's rapid growth.

With a capital of only $50,000 in 1898, it employed 250 men in its factory, which was driven with a 250-horsepower engine, purchasing crude rubber in 500-pound cases, while it now purchases crude rubber in 100-ton lots and operates and employs 1,750 men. Engine capacity, 2,050 H. P. In 1898 all sales were made from the factory, while to-day it has twelve branch sales departments in leading cities, with three stores in New York city and two in Chicago. The company now produces 2,000 pieces of brake hose per day alone.

large quantities of steam hose, tank hose, wire wound hose, for which tons of half-round, flat, round and oval wire are consumed, suction hose, fire hose, cotton jacket and mill hose, garden hose, grader hose, rubber belting of all kinds, conveyor belts.

Sixty hydraulic presses are used to make moulded goods. Rubber automobile tires of various kinds are produced, as well as tires for bicycles and other vehicles, and other lines ot rubber goods.

Bockel Bros., of Herreid, S. D., will manufacture cement blocks.

CONCRETE RAILWAY TIES.

A report is being widely circulated that concrete ties laid on the right of way of the Lake Shore and Michigan Southern Ry. are to be taken up and discarded. This is denied by a high official of the L. S. & M. S. Ry., says the Iron Age. Concrete ties are a complete success and more will be used. The Lake Shore Ry. has been using the C. Buherer concrete tie, which is simply an old piece of rail turned upside down and imbedded in concrete with the flange of the rail flush with the top of the tie. It resembles in shape and form the ordinary wood tie common to all railways. The Buherer tie is a heavy, clumsy affair and might be greatly improved by reducing both the iron and the concrete and resorting to a more practical distribution of these materials as carried out in reinforced concrete construction.

The Italian government is now using the reinforced concrete ties on its principal trunk lines with the best of results as well as economy compared with the wooden tie.

There is a great field for the concrete tie in this country. A single road, the North-Western Railway Company, purchased in a single year over $750,000 wooden ties. As wood is yearly growing scarcer a substitute must be found, and for such a substitute a well designed reinforced concrete tie seems to be the ideal combination of materials. The railway companies have taken notice of the growing scarcity of timber for ties and are now planting large areas with young trees in order that they may not run short of wooden ties in the future. The Louisville & Nashville Ry. is now planting 1,400 acres of land at Carneys, Ala., with catalpa trees for tie timber. The Illinois Central Railway have much larger timber tie forests planted. The L. & N. Ry. in May planted 200,000 trees and expect to have 1,332,000 trees planted before the season closes. This shows the demand for ties as well as the magnitude of consumption of the wooden railway tie, which must eventually be displaced by the concrete tie.

DEPARTMENT OF COMMERCE AND LABOR.

Bureau of Manufactures.

Washington.

To Manufacturers and Exporters:

The Department of Commerce and Labor is desirous of securing the cooperation of manufacturers and other persons interested in the efforts being made by this department, through the Bureau of Manufacturers, to extend the foreign trade of the United States.

In furtherance of this work, it is proposed to establish a comprehensive card index which will enable the department, upon application, to furnish information desired by manufacturers, or by intending purchasers, and it is contemplated to extend the system, if the necessary authority shall be granted by Congress, to our principal consulates.

To enable the Bureau to prepare such an index, you are respectfully requested to fill in the accompanying blank, and furnish briefly any additional information which you may desire to have recorded in connection with your business. In mailing reply please use the inclosed envelope.

Very respectfully,
JOHN M. CARSON,
Chief Bureau of Manufactures.

P. S.—Blank forms may be obtained on application to the above address.

Kansas City, Mo.

Editor Cement and Engineering News.

Can you give me a formula for making cement blocks water proof?

Yours truly,
E. F. A.

Ans.—Concrete blocks can be made partially waterproof by the use of hydrated lime mixed with the facing or throughout the block as follows: To each bag of cement, weighing 95 lbs., add 15 to 20 lbs. of ground hydrated lime free from grit; mix the cement and lime dry to a uniform color and then mix with the sand, gravel and crushed stone; the aggregates should be so graded as to produce the least voids in the mass.

The second method is to take 1 peck of well burned lime, place in a barrel, add just enough of water to cause the lime to fall into a powder. After several days add water enough to fill the barrel and the unslaked particles after thorough stirring will fall to the bottom while the dissolved part forms milk of lime. Take from 2 to 4 qts. of this lime mixture and mix it into the water to be used in gaging the concrete and the block will prove fairly waterproof.

Where a concrete block building has already been erected, a wash composed of barium hydrate, 5 ounces to each gallon of water, may be used. Apply to the surface of the wall. Several coats should be applied at intervals. The solution must be used fresh as it soon becomes turbid if left in air. This solution is cheap and effective. It fills and seals the pours by absorbing carbonic acid from the air. —Ed.

INCORPORATIONS.

Ohio Cement Stone Co. of Toledo, O. Capital $30,000.

The Concrete Pole Co. of St. Catharines, Ont. Capital $100,000.

The Sturges Cement Block Co., Kansas City, Mo. Capital, $2,000.

The Red Wing (Minn.) Cement Co., incorporated. Capital $25,000.

The Climax Cement Block Co. of Rock Rapids, Iowa. Capital $7,500.

The Reliance Cement Co. of Philadelphia, Pa., has been chartered. Capital $500,000.

The Durable Cement Brick Co., of Detroit, Mich., has been incorporated. Capital $600,000.

Texarkana Concrete Building Co., of Texarkana, Ark. Capital $10,000, of which $3,000 has been paid in.

The Ridner & Spangler Co., of East Orange, N. J. Capital $25,000, to manufacture concrete block and brick.

The Toledo Cement Block Co., of Toledo, O., has purchased the plant of the Toledo Cement Building Block Co.

The H. & S. Artificial Stone Co., Inc., Cleveland, O. Capital $10,000. Incorporators, A. V. Cannon, L. M. McCraith, J. Haber and others.

The Ohio Portland Cement Co., of Wellston, O. J. A. Lockhard, S. F. Baines and Grant McGhee of McArthur, Michael Kramer of Chillicothe, and ex-Congressman D. Linn Gooch of Covington, Ky., incorporators.

The Western Canada Cement and Coal Co. of Ottawa, Canada, has been incorporated. Capital $1,250,000. The incorporators are all of Ottawa. To manufacture and deal in cement and by-products thereof.

The Perrin Cement Machinery Company. Capital $50,000. The company will manufacture and sell cement machines and machinery for working of cement. The plant will be located in Marion, Ind., Richard R. Cramer and Ross Watson of Marion, and Jas. H. Perrin of Columbus, O., are the directors, and Col. E. Bright of Columbus, O., and J. William Lester of Bluffton are other stockholders.

A cement plant has been organized at Monterey, Mexico, under the name of the Monterey Portland Cement Co. Capital $700,000. To be located near Monterey, state of Neuvo Leon, on the Mexican Central, Mexican International and Mexican Mineral railways.

Nashville, Tenn., Aug. 1.—A charter was granted to-day to the Tennessee Cement and Lime Company, composed of Nashville and Coffee County capitalists, with $25,000 capital. The company will manufacture lime and operate the first Portland cement plant in Tennessee on their lands in Coffee County. It is the intention to increase the capital stock to $125,000 within a few weeks. The offices and warehouse will be in Nashville.

A Portland Cement plant is to be erected in Whatcom, Washington, by Messrs. Balfour, Guthrie & Co. of San Francisco and parties identified with the Condor Portland Cement Co. of Belgium. Dr. Wm. Michaelis of Chicago has proposed plans for the plant and will be engineer of erection. First class limestone and shale will constitute the raw materials.

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By E. Lee Heidenreich
Mem. Am. Inst. Min. Engs. Mem. West. Soc Engs.
A Treatise on the Use of Concrete and Steel
Covering Floors, Arches, Bridges, Partition Walls, Bridge Floors, Sewers, Conduits, Tanks, Reservoirs, Grain Elevators, Foundations and General Hydraulic Engineering, under the Monier System of Construction,
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DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor as a filler for portland Cement paint will cover from 15 to 20 sq. ft. of surface, depending upon the density or porosity of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

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5 Pound Samples F. O. B. Chicago, $1.00. This can be mixed with 60 pounds sand and gravel and 10 pounds cement for Densitor Concrete. Terms strictly cash.

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The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED
GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.
We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
Washington, D. C.

WANTED AND FOR SALE ADS.

WANTED.

"Superintendent—First-class mill man to take charge of 500-barrel plant running on Cement Rock. Address, with references, 'Western,' care of Cement & Engineering News."

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

Wanted Superintendent

First class superintendent and assistant for modern 2000 barrel capacity cement plant. Address with reference, "Modern," care CEMENT & ENGINEERING NEWS, Chicago, Ill.

AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

DRAUGHTSMAN wants position; six years' experience in designing, remodeling and drawing up plans and specifications for Cement Plants, Address "Draughtsman," care of CEMENT AND ENGINEERING NEWS.

FOR SALE—A Roofing-tile and Building-block Plant, consisting of 2 American Cement Roofing-tile Machines, 2 Building-block Machines, 1 Brick Machine, a good stone building and one acre of ground. Good location and well established trade. Will make a low figure to quick buyer. Address J. A. DANNENBERG, Paulding, Ohio.

WANTED — First-class superintendent for modern 500-barrel capacity slag mill. Address, with references, "Canada," care CEMENT & ENGINEERING NEWS.

WANTED—A chemist, experienced in the manufacture of Portland Cement from marl, by wet process. Apply, giving in detail age, experience, references, salary wanted, and whether married or single, to Box B. C., care of CEMENT & ENGINEERING NEWS.

SITUATION WANTED—As assistant superintendent and mechanical engineer in cement mill. Seven years practical experience. Wet and dry process. Can introduce new designs and improvements. First-class references. Address G. E. F., care Cement & Engineering News.

FOR SALE

Two Normandin Block Machines and pallets for sale. Machine is in first-class condition, having been in use but two months. For price, apply to

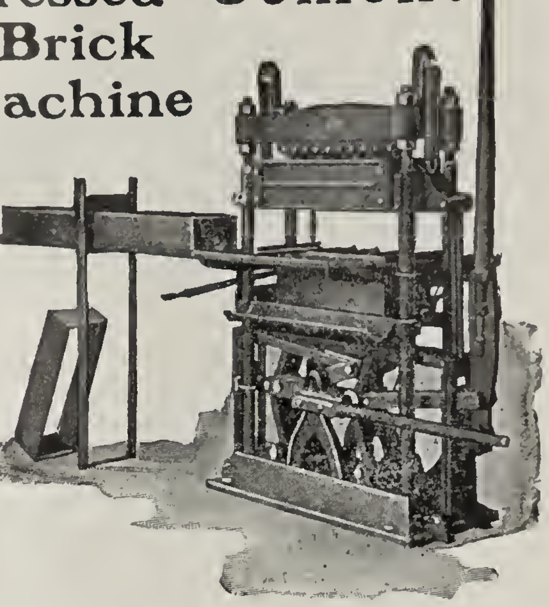
HORTON CONCRETE CO.,
Iola, Kansas.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

POSITION WANTED.

A thoroughly practical cement chemist is open for engagement. Technical training and mill experience. Address Box A. O., CEMENT AND ENGINEERING NEWS.

Cement & Engineering News has removed to 226 La Salle Street.



The Helm Patent Pressed Cement Brick Machine

Competes with blocks successfully, producing plain pressed to highly ornamental face brick. No concrete yard complete without it. Ten plain or ornamental bricks at each operation, pressed on pallets avoiding handling with 80,000 pounds pressure, pressed face up. Made in any color desired, all brick is absolutely of the same size, operates from one to three times a minute, depending on yard arrangements. The price will interest you. Descriptive and illustrated catalog sent on request.

Helm Brick Machine Co.
Traverse City, Mich

KRUPP

Ball Mill
Tube Mill
Steel Balls

For CEMENT WORKS
For Grinding
RAW MATERIALS, CLINKER AND COAL

THOS. PROSSER & SON, 15 Gold St., NEW YORK, Old Colony Bldg., CHICAGO

ARCHITECTS' AND ENGINEERS' HANDBOOK OF

Re-Inforced Concrete Constructions

172 pages. Illustration and Diagrams 217 Pages.
By L. J. MENSCH, C. E.
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Cement and Engineering News,
162 La Salle Street, CHICAGO, ILL.

GRIFFIN —MILLS—
REPAIR PARTS

GIBS, TRUNNIONS —AND— PRESSURE RINGS

RIGID INSPECTION BEST MATERIALS
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LIME ROCK SLATE SHALE

ARE THE RAW INGREDIENTS WHICH MIXED IN THE PROPER PROPORTIONS MAKE THE

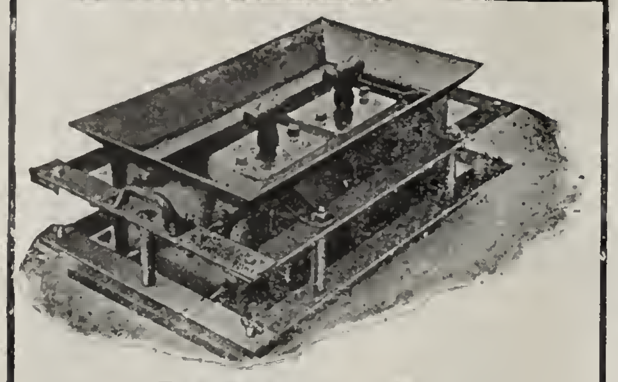
HIGHEST GRADE
PORTLAND CEMENT

We have 400 acres containing an inexhaustible quantity of these materials; located on two trunk lines; low freight rates; steady demand for the product; unusual facilities for exporting; an abundant water supply, combine to make this the most attractive proposition ever offered for the location of a

PORTLAND
CEMENT FACTORY

For further information address the undersigned, who will gladly submit samples of the materials together with an analysis.

J. W. WHITE,
General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.



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1 MAN CAN MAKE BLOCKS PER DAY 200
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Abundance of High Grade Materials!
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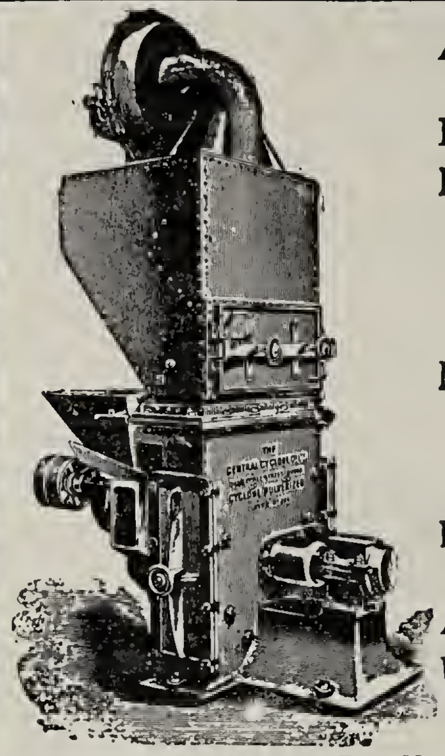

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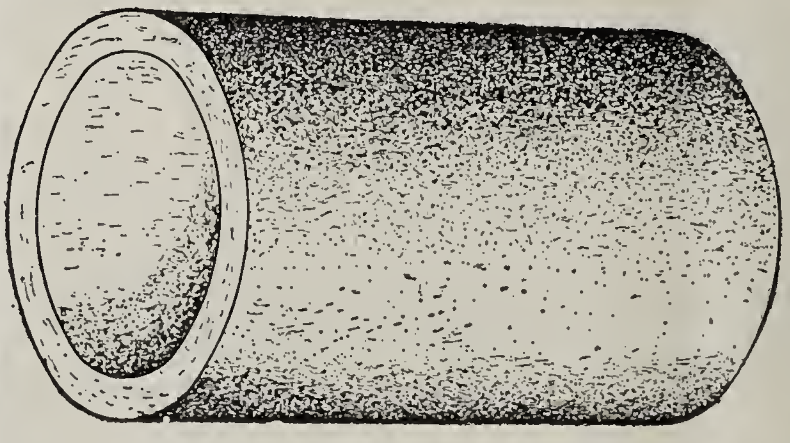

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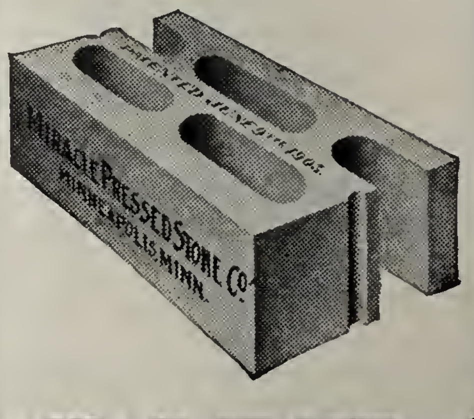
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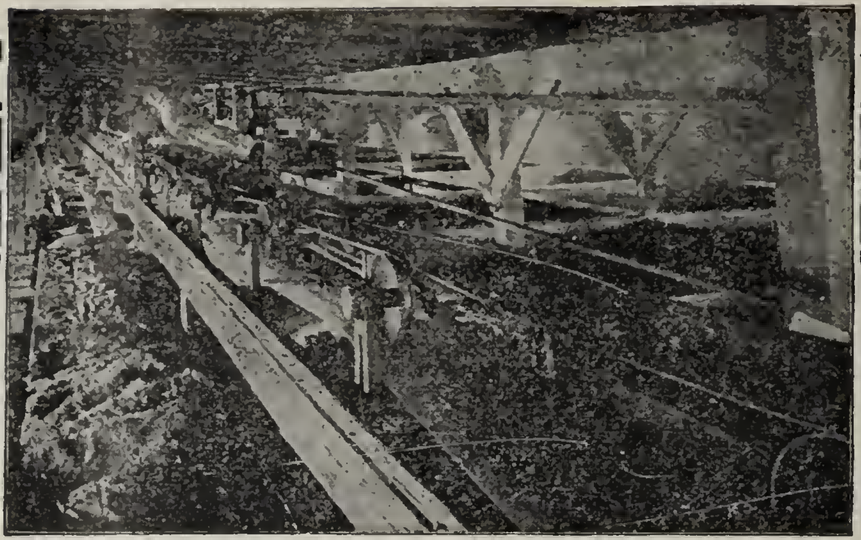

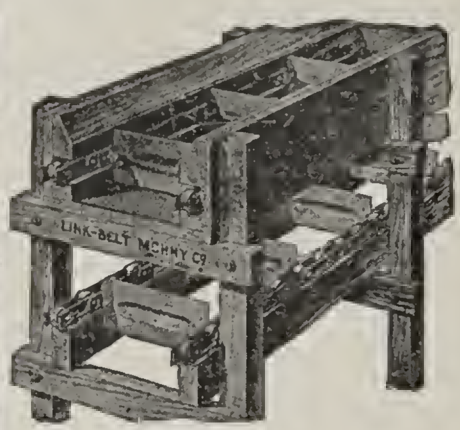

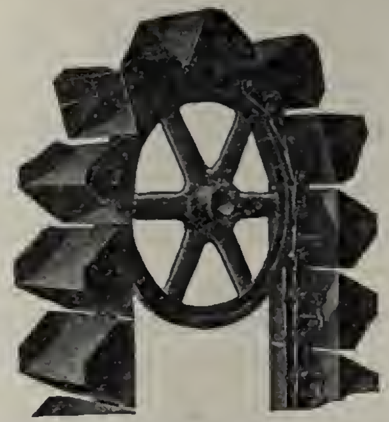

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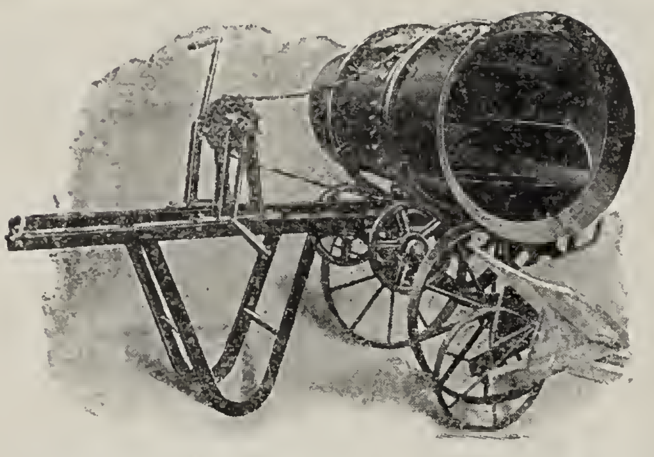

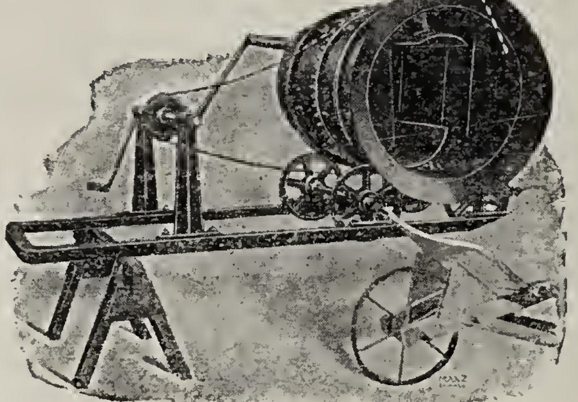

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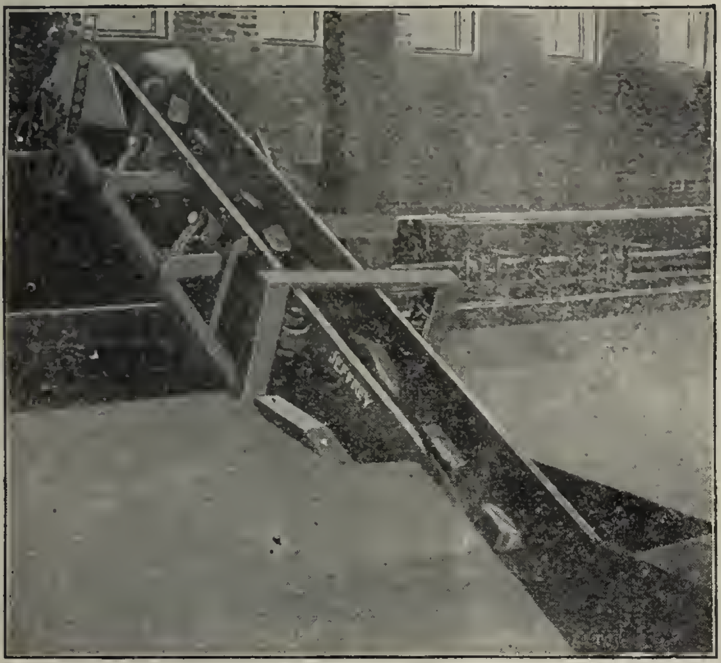

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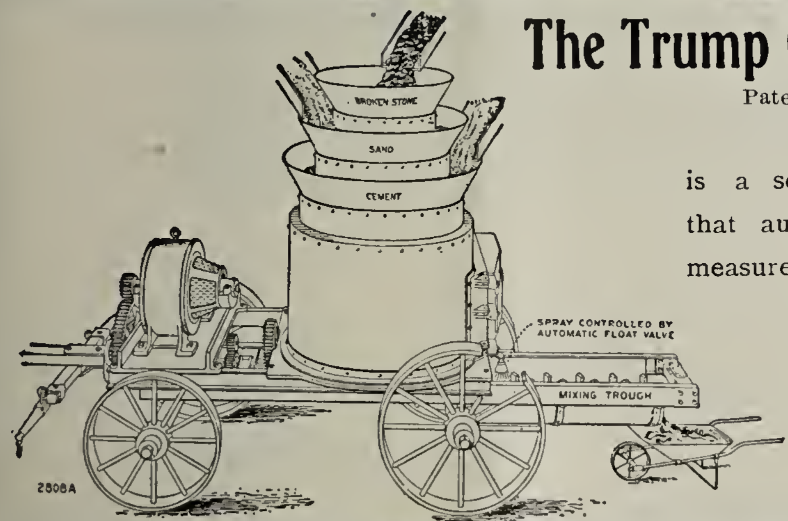

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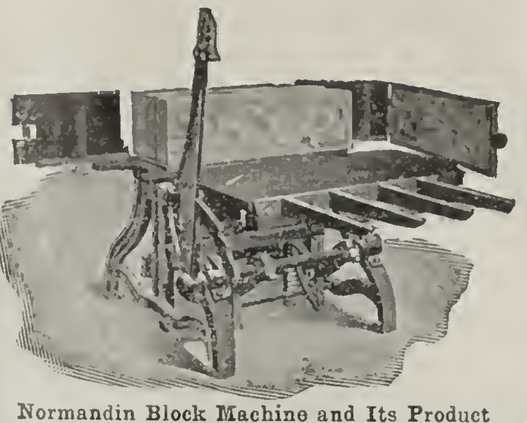

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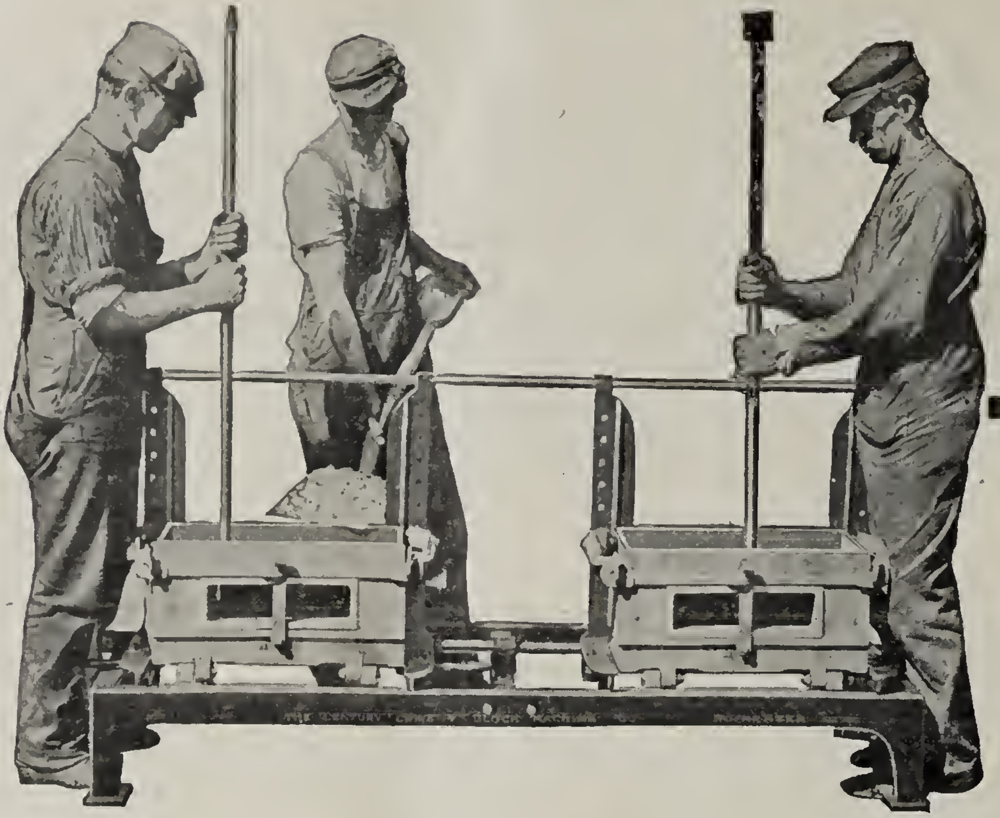

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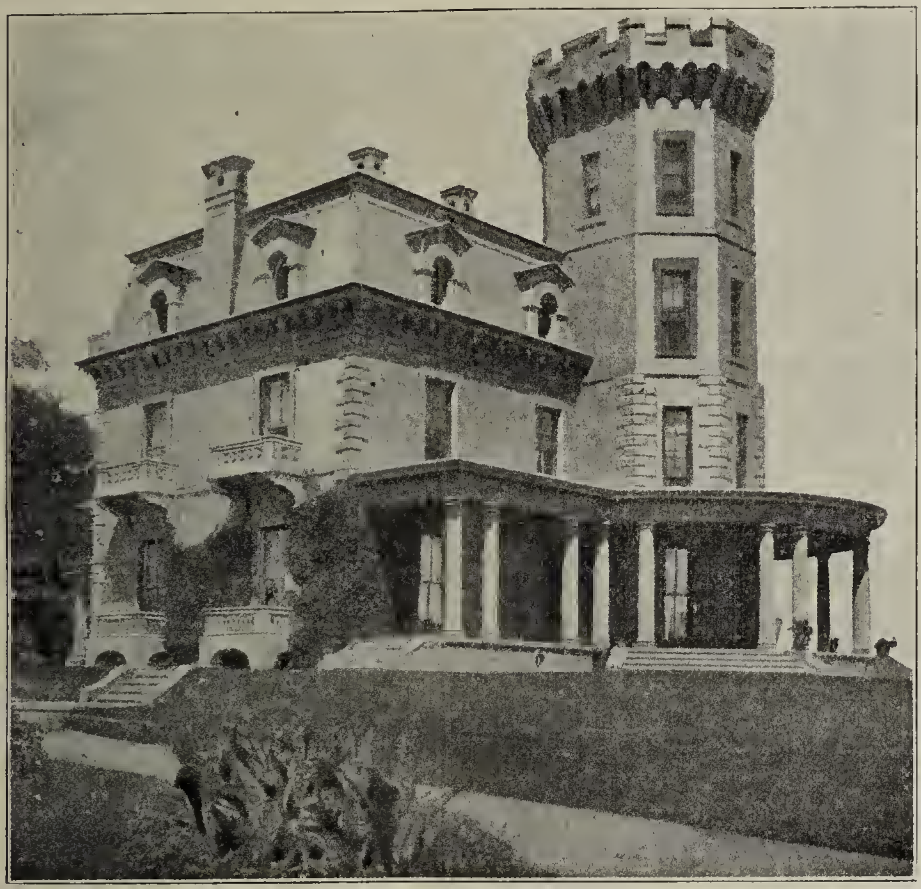
THE FIRST REINFORCED CONCRETE BUILDING IN THE UNITED STATES.

The pioneer reinforced concrete building erected in this country was a large dwelling house designed by W. E. Ward at Port Chester, N. Y., and erected under his own supervision in 1875. It is in perfect condition to-day. It will be a matter of surprise to our readers to learn how thoroughly Mr. Ward grasped the leading principles of reinforced concrete construction thirty years ago. His ideas must be regarded in line with the best forms of construction of to-day.



Reinforced Concrete Dwelling, Erected in 1875.

In 1883 Mr. Ward read a paper before the American Society of Mechanical Engineers, describing with illustrations, this building and methods of construction. This paper we herewith reproduce as follows:

Beton in Combination with Iron as a Building Material.

(By W. E. Ward, Port Chester, N. Y.)

If society is indebted to the restless spirit of progress for most of its modern comforts and conveniences, it certainly is not yet a debtor for any methods which guarantee immunity against calamities from fire. While other departments of industry have received the benefits of improvement, the continuous and persistent use of combustible material for exposed portions of buildings has limited the intrinsic elements of the art of building construction, and confined improvements only to matters of design.

Incombustible materials are easily obtained and much better adapted to the purpose for every apparent reason. Doubtless the question of increased cost, both in money and in time, required for more thorough construction may be in a measure responsible for the tardiness in adopting safer methods, and, in addition to greater expenditure, there may have been a want of confidence in the fire-proof methods which have been offered to the public for adoption. The importance of this question induced the writer, in 1871 and 1872, to make some experiments in a new and special direction, for the purpose of ascertaining whether a practically fire-proof building could be designed and constructed at a comparatively moderate cost.

The incident which led the writer to the invention of iron with béton occurred in England in 1867, when his attention was called to the difficulties of some laborers on a quay trying to remove cement from their tools. The adhesion of the cement to the iron was so firm that the cleavage generally appeared in the cement rather than between the cement and the iron.

The line of experiments which followed were confined exclusively to working up the reciprocal value of béton, in combination with iron, in the construction of beams which were designed for supporting floors and roofs made of the same material. In this particular, the facts were conclusively developed, beyond question, that the utility of both iron and béton could be greatly increased for building purposes, through a properly adjusted combination of their special physical qualities, and very much greater efficiency be reached through their combination than could possibly be realized by the exclusive use of either material separately, in the same or in equal quantity.

Experience had long ago proved that unprotected iron, associated with combustible materials, is altogether unreliable for building purposes when exposed to a severe fire test; but it has been demonstrated that if iron is well protected by a heavy clothing of béton, its integrity can be safely depended upon under almost any emergency.

When all doubts were removed concerning the reliability of the several combinations of materials required in the construction, a building embracing the following radical new features was erected, for dwelling purposes, near Port Chester, N. Y. Not only the external and internals walls, cornices and towers of the building were constructed of béton, but all of the beams, floors and roofs were exclusively made of béton, reinforced with light iron beams and rods.

Furthermore, all the closets, stairs, balconies and porticos, with their supporting columns, were molded from the same material. The only wood in the whole structure was in window-sashes and doors with their frames, mop-boards and the stair-rails; thus excluding everything of a combustible nature from the main construction.

Béton can be used in any form of construction, and is able to serve the requirements of any architectural or decorative effects. All the exterior portions of this house, which are more or less ornamental in their functions, were made of béton in place during the progress of the work. In the interior of the house, the cornices, stiles, and panels of the ceiling are formed of béton, and covered with the hard finish usual in such work. There appears to be no limit to the reproduction in béton of any form used in stone masonry or in stucco. The proportions of material composing the béton for the work varied in strength to meet the requirements of the different parts of the structure, the heavy walls needing the least proportion of cement, while the beams, floors and roofs required a much larger proportion. Only the best quality of Portland cement, clean beach sand, and crushed bluestone were used in combination with iron for constructing the building.

The proportions of cement used for the heavy wall work were one part of cement to four parts of sand and fine gravel, thoroughly mixed dry, and dampened with only sufficient water to give it the consistency of well-tempered molding sand.

A finely crushed and screened hard blue limestone was found to be better adapted for use in combination with the béton than a coarse-sized stone filling, because small-sized stones pack closer than large ones, thereby realizing a proportional saving in cement. The tests made to ascertain the comparative transverse strength of different compositions proved that the bond was stronger in béton made with small stone. In breaking test-sections made of béton in the form of bricks, the fracture of those filled with small stone was almost invariably across the stone lying in the line of fracture, while the fracture of the test bricks made with a filling of stone three or four times larger, showed a frequent tearing away from the bond between the béton and the larger stone filling, the composition of the béton being the same in both cases.

The proportions of cement and coarse beach sand and gravel, used in reinforcing iron beams for floors and roof supports, were one part of cement to two parts of sand and gravel. The size of the iron beam, selected for an experimental test, was a four-inch I beam of lightest pattern, twelve feet long, weighing thirty pounds to the yard, and its safety load was limited to eleven hundred and fifty pounds. A plank mold was made the length of the iron beam, twelve inches deep by five inches wide, in the bottom of which a layer of béton was first moderately tamped down to an inch in thickness; then the iron beam was laid on the course at equal distances from each side of the mold, and settled down on the surface of the course of béton to a good bearing. This brought the top surface of the beam seven inches below the top of the mold. The work of filling and tamping the courses was then continued until the mold was filled.

The reason for placing the iron beam so near the bottom of the mold was to utilize its tensile quality for resisting the strain below the neutral axis when this composite beam was exposed to heavy loads, while the béton above this line was relied on for resisting compression from load strain. The béton became thoroughly hardened in about thirty days, when the following tests of transverse strength were made. It was placed upon suitable supports, with a bearing of three inches at each end. A lever was adjusted so as to bring the testing load on a knife-edge bearing at the center of the beam. Weight was then applied to the long end of the lever, until the stress on the center of the beam reached nine thousand five hundred pounds. Under this load there was a deflection at the center of the beam of seven-sixteenths of an inch, but not a sign of rupture appeared at any point.

The load was then removed, and the beam returned to the original line it occupied before the test, showing that the combination possesses the essential quality of elasticity in addition to the enormous increase of capacity to resist strain over that which was possible for either material to sustain if used separately and in the same quantity.

It is suggested for the future construction that an inverted T beam would furnish a more prefarable distribution of iron in the composite beams than the I beams which were used.

The result of this experiment demonstrated the reliability of the composite beam of iron and béton, and showed that the adhesion of the cement to the iron could be relied on under heavy strains; and warranted the adoption of béton reinforced with small rods for the floors and roofs.

The beams for supporting the floors throughout the house were placed at such convenient distances apart as to insure perfect safety to the floors, and at the same time affording ample opportunities for producing the best effects in deep, paneled ceilings.

The beams were all molded in position, where they belonged, both for the floors and roofs, and after the same method that the experimental beam was made. The iron beams varied in width and weight per yard in accordance with their length and the prospective load; the largest being nineteen feet long by seven inches wide. When the combination beams were completed and ready for the floors and roofs, heavy planks were firmly placed in position and securely supported between the beams; the upper surface of these plank foundations being adjusted on a level with the top surface of the molded beams. These planks served as the bottom of the floor molds, and after the béton comprising the floor was hardened they were removed.

Channel ways had been molded in the walls, on a line with the top of the beams, for the purpose of supporting the outer edges of the floors.

Before the floors and roofs were laid, care was taken to cover all the supporting surfaces with paper, to prevent the adhesion of floor and roof sections to their supports. This precaution was necessary, to permit the movement of the floors and roofs that would unavoidably take place under varying temperatures and loads.

A part of the experimental system contemplated an attempt to warm the house by passing currents of heated air between the floors and ceilings, and up through flues made in close proximity to each other for that purpose, in the interior walls of the building, and it was necessary to core out a liberal area of lateral openings through the upper portion of the beams, in order to permit a free circulation of heated air. The ceilings rested upon flanges projecting from the lower portion of the beams, as shown in Figure 1.

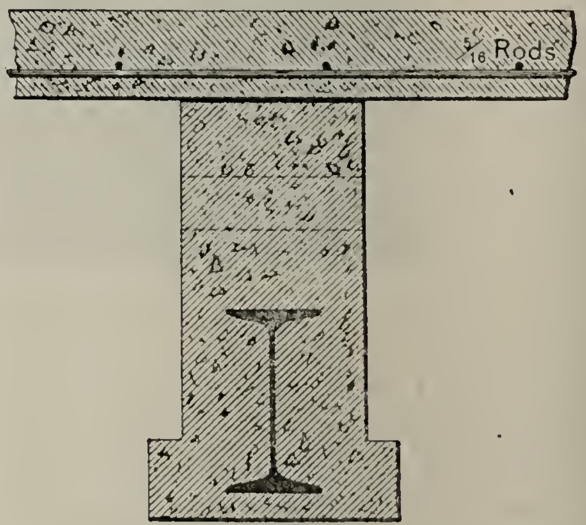


Fig. 1.

Instead of using sand and gravel, or both, in combination with cement, for floor and roof construction, the preliminary experiments that proved the superior value of broken blue stone for massive work, led to the adoption of washed, fine screenings from the same material for the floors and roofs, because its greater angularity than gravel insured a stronger bond in the work than could be realized by using sand and gravel.

The proportions of materials used for this purpose were: one part of Portland cement to two parts of the fine stone screenings. The preparations being completed for laying down the floors, a thin course of the béton was first put on, and evenly tamped down to about an inch in thickness, over the whole space intended to be covered. Then rods of iron, five-sixteenths of an inch in diameter, were placed both longitudinally and laterally, at a uniform distance of eight inches apart, over the whole surface. Then, on this, a final layer of two inches in thickness was carefully tamped down. In about eight hours, the béton was hardened sufficiently to allow the application of the top surface, which was floated down with a half-inch coat of cement and fine beach sand mortar, made of equal parts of each. This completed the final finish, and made the whole thickness of the work three and a half inches. It will be observed that for the same reason as in beam construction, and, as before explained, the iron rods for reinforcing were placed near the bottom of the work, so as to resist the tensional stresses due to the load, while that due to compression in the upper portion would be sustained by the béton alone. In this manner, and by this process, over thirteen thousand square feet of flooring and roofing were constructed to fill the requirements of the building.

The only test of any consequence upon the combined strength of the floors and beams together was made on a section of the widest floor in the house, where the beams are eighteen feet span and six feet between centers. Casks of plaster were placed upon the floor over the beam, forming a triangular load of thirty tons, which was sustained without any injury to the floor, or measurable permanent deflection. The dimensions of the beam that sustained this load were seven by sixteen inches, and eighteen feet span, reinforced in its lower portion with a seven-inch I beam, weighing fifty-five pounds to the yard.

This test indicates that in addition to its admitted fire-resisting qualities, the reinforced system of construction challenges comparison with other methods of building in matters of strength and of cost, whether for buildings requiring long or short floor spans.

Experimental tests were made with several partition walls, to ascertain how thin it would be advisable to construct them for light walls where the load was small. The result of the experiment showed that the resistance of partitions eight feet in height made of béton two and a half inches thick, and reinforced with one-quarter inch iron rods, was equal to brick walls eight feet high, and eight inches in thickness.

It is the opinion of the writer that for the great majority of houses required for dwelling purposes, a system of thin re-enforced double walls, with a space of from six to ten inches between them and re-enforced cross connections every two or three feet apart, to unite the outer and inner walls firmly together, could be built up to thirty or forty feet in height, at a cost not exceeding that of first-class brick work.

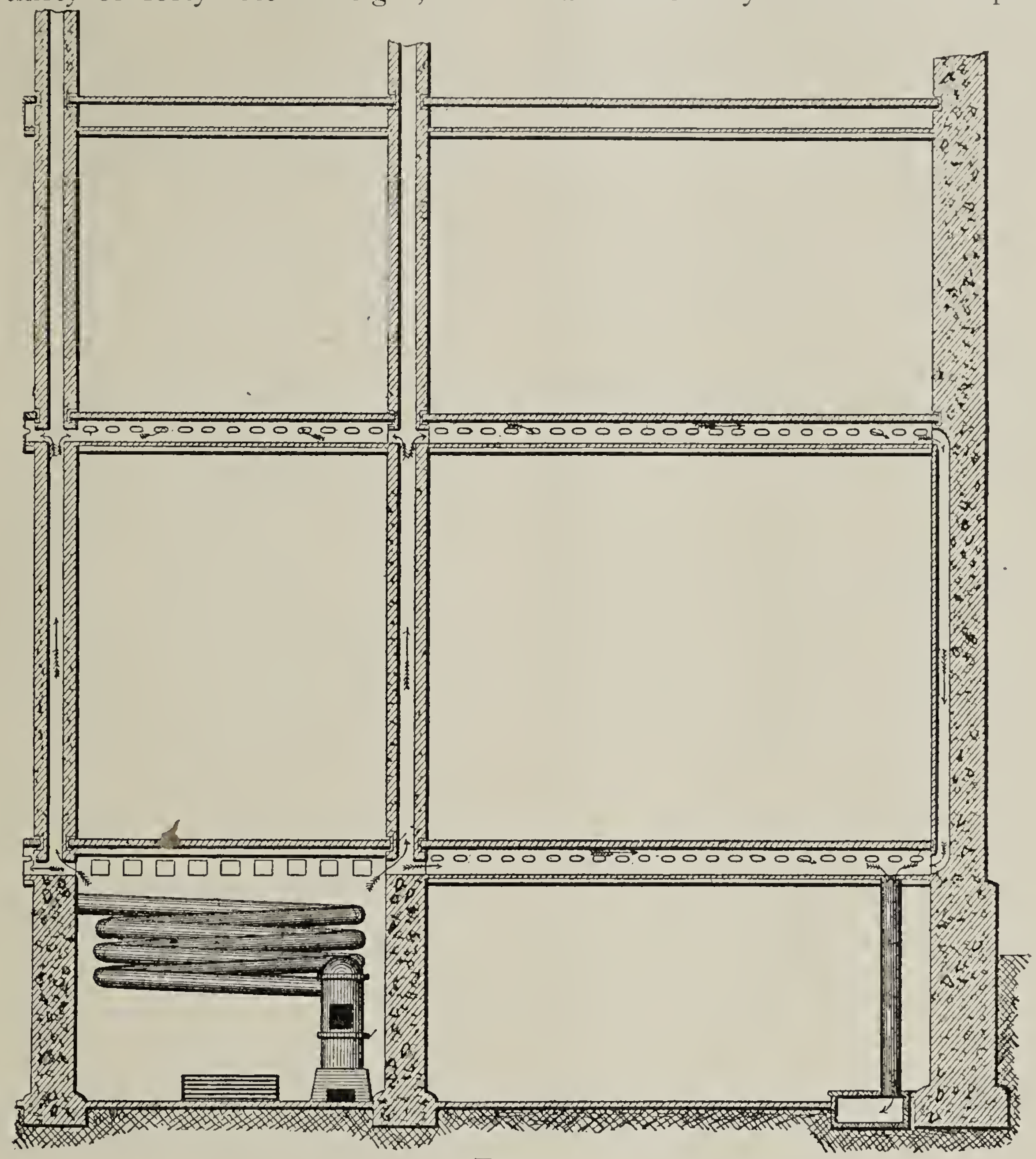


Fig. 2.

Skeleton Reinforced Concrete Construction in 1875.

Besides an equal economy in the construction, such double walls would be an incomparably better defense against stormy weather than the best quality of brick work, because the absorptive capacity of béton is so much less than that of brick.

Thus, all things considered, the thin double wall system commends itself as containing the main desirable qualities essential to the outer and inner wall construction of dwelling houses, embracing, as it would, a sure protection against both fire and dampness, and the means for thorough ventilation. Besides the special fitness of the reenforcing system for floors, roofs, beams and thin walls, it is an interesting question whether the same system may not be also applicable, and advantageously extended to a more general use in many engineering requirements; especially in situations where immense weights must be sustained, and where iron construction alone is difficult of application, notably in such an important work as the Hudson River Tunnel, where its tubular form is constructed with an outer cylindrical shell of flue iron, and lined inside with heavy brick mason work; much of this tunnel rests upon a treacherous bed of silt, and might be made absolutely safe from a rupture caused by settlement, induced by vibrations resulting from railroad traffic in addition to its own weight, by adding to a thin brick lining a strong béton about sixteen or eighteen inches thick, and working in it three or four courses of iron bars, of suitable size, laid longitudinally and in sufficient quantity to bear any amount of strain that settlement or any other cause might bring upon it. Rings of flat bar iron, interspersed in the béton lining a few feet apart, would further add to its security.

Although the writer has no personal knowledge of the methods which are to be used in filling the interior of the Statue of Liberty, to be erected on Bedoe's Island, New York Harbor, he is of the opinion that a filling of béton, re-enforced with iron, furnishes the best method of increasing the stability of that colossal statue.

The re-enforced béton system has also been employed with admirable results in heavy foundations for stationary engines. The writer, three years ago, mounted a two-hundred-and-fifty-horse-power tandem compound engine, of very heavy pattern, on a re-enforced béton bed, twenty-three feet long, five feet wide, and seven feet deep. It is apparently as firm and hard as a single mass of granite of those dimensions. The outboard bearing of the main shaft is also mounted on a single block of the same kind of construction. The cost of these foundations was less than the estimate made for the same in first-class brick or stone mason work.

It has also been used for lining a reservoir of 96,000 gallons capacity, which has blasted into a ledge.

Another great advantage realized in re-enforcing béton with iron is that the iron overcomes its tendency to check in hardening, however large the surface may be, within useful limits, if the distribution of the iron through the work is made with ordinary good judgment. This is demonstrated in the instance of entire freedom from shrinkage checks in the single section of béton flooring laid in the drawing room of the house under consideration. Its dimensions are eighteen by thirty-six feet, three and a half inches thick, and there is no trace of a check throughout its whole extent, after a period of eight years since it was laid down; and six years of that time it has been, during winters, more or less subjected to unequal strains from expansion and contraction, caused by its exposure to unequal temperatures, while employed as a transmitting medium of heat for warming the room. The method of heating the house is shown in Figure 2, where the section of a portion of the house exhibits the arrangement of hot room and heating flues in the walls and floors.

In the center of the cellar is a heating chamber, measuring eleven by sixteen feet, and eight feet in height. Within this chamber is placed an ordinary cast-iron heater, of a capacity for burning about three hundred and fifty pounds of coal per day. Openings were made, about twelve inches apart, all around the top of the surrounding walls of the chamber, leading outwardly to the spaces between the first floors and the cellar ceilings, and also up through the flues within the interior walls which communicate with the spaces between the second-story floors and ceilings beneath them. Vertical iron pipes, of suitable size, are located so as to connect the open space between the cellar ceilings and first floor with a large, closed trunk, or passage-way, which extends nearly all around the inside of the main wall foundation, under the cellar floor, and finally terminates in a large flue, which leads directly under and into the heating chamber.

This comprises about the whole system of arrangements in the construction for warming the house with heat radiated from the floors and interior walls.

Its mode of operation simply consists in the body of warmed air passing from the heating chamber upward, through the walls and under the floors, and in its passage giving up its surplus heat to the surfaces of these flues. As the air becomes reduced in temperature, it naturally descends back through the pipe and trunk passage-ways provided for its return to the heating chamber, where it is again recharged with heat. It will readily be seen that, by this method, a continuous circulation will be maintained with the same quantity of air; and, furthermore, that the velocity of the current will vary with the difference of temperature of the air when leaving the heating chamber and re-entering the heating chamber.

By this system there are about fifty-five thousand cubic feet of the interior of the house heated by radiation, through about thirty-five hundred square feet of floor and wall surfaces, and the capacity of the heating chamber is fourteen hundred cubic feet, so there is one cubic foot of heated air to forty cubic feet in the house.

The temperature of the air in the heating chamber averages, in very cold weather, one hundred and seventy degrees, and after delivering its surplus heat to the floors and interior walls, its temperature registers fifty-eight degrees in the flue where it re-enters the heating chamber for re-heating; showing that one hundred and twelve degrees of heat has been given up and utilized for warming purposes. With ordinary care in managing the furnace, a temperature of sixty-eight degrees can be uniformly maintained on the first floor, and from sixty to sixty-two degrees on the second floor, with a consumption of about three hundred and twenty-five pounds of anthracite coal per day in the furnace.

The temperature produced by this system of heating is free from the objectionable extreme variations so common with other modes of heating. The walls and floor form such large heating surfaces that the temperature is uniform in all portions of the rooms, while the air is not vitiated by escaping gases or heated dust, as is universally the case where furnaces or steam pipes are used for heating.

It is not claimed that its economic result per pound of coal is greater than that which is claimed for the steam or hot-water systems, but if the latter were required to make as liberal a provision for the renewal of fresh air in the interest of an equally good ventilation, the percentage of useful results per pound of coal from steam or hot water would average no higher than the former.

The rain-water falling upon the roof passes through two six-inch iron pipes, which are set in the walls, extend across the cellar, and reach into a béton tank in the rear tower, and holding 5,000 gallons, whose water level is thirty inches below the level of the roof. This inverted siphon also forms a distributing system to the various points of consumption in the house, through short branch pipes connected to these mains.

There are also two other tanks made of béton, and holding 3,000 gallons, situated under the main tank. One of these sustains a head of over twenty feet of water, and has never given any indications of leakage.

In regard to the important factor of cost involved in this system of béton construction, its average for beams, floors and roofs, including the supporting platforms for laying them down, was a fraction over sixty cents per square foot. This cost also includes the re-enforcing iron beams and rods. The cost of the heavy wall work, not including cornices, was about twenty-four cents per cubic foot, which includes the cost of plank molds required for building up the walls. The advantages that most favored these economical results were cheap material and cheap labor.

The bulk of the material required for the work abounds in inexhaustible quantities, and is always obtainable at moderate cost. The essential skill required consists in a simple knowledge of the right proportions of material, and of its proper manipulation, both of which can be acquired in a half-day's practice. The most inexperienced laborers can do all the work of the most elaborate béton construction, excepting only the surface finishing, and this, with all the other work, can be superintended by one competent, experienced builder.

Along with the foregoing data, it may be well to include an interesting feature of some experiments that were made to test the heat-enduring qualities of béton. A number of large test bricks were made of the same proportion of materials that was used in the construction of the walls, and in subjecting them to different intensities of heat to see how much they could withstand before breaking up, there was no perceptible difference observed in the tendency to fracture whether the bricks were exposed to a gradual or rapid heating. Not one of them broke when subjected to a white heat. Several were heated to a bright red heat, and then plunged into a bath of cold water. They withstood this test without showing a decidedly damaging fracture, and one of the bricks was exposed to an alternate heating and cooling three times before breaking up.

These results were a surprise, and they suggest the advantage of such a material for the walls of buildings, as a sure defense against uncontrollable conflagrations. The facts that appear to be established by this line of experiments are:

First: That a system of iron beams re-enforced with béton can be made to sustain weights many times greater than the iron beams alone can withstand without re-enforcing.

Second: That floors and roofs can be economically made of béton re-enforced with iron rods, capable of sustaining heavier loads, with a less number of supporting beams, than any other system of flooring and roofing now in use, at equal cost.

Third: That the system of re-enforced beams and floors afford advantages for a more perfect system of heating buildings uniformly than by the steam or hot-water systems.

Fourth: That the sanitary requirements of complete ventilation are plainly within the reach of this system of construction.

Fifth, and finally: That it affords a perfect defense against the interior destruction of buildings by fire.

The intrinsic worth of béton construction appears most valuable in furnishing the elements of fire-proof construction; and thus inaugurating a reformation in the prevailing system of building based on the principle that safety from loss by fire can be more economically realized through reformation than by exclusive dependence on insurance to indemnify for losses by fire. The amount of capital destroyed by such losses appears almost fabulous, and has been estimated by insurance authorities to be over one hundred million dollars annually in this country. This enormous amount takes no cognizance of the losses due to the disturbance of business relations and to labor by such enforced interruptions of industry, but the sum of the losses accounted for seems to be enough to awaken an interest in the discovery of some effective remedy for reducing their magnitude.

Yet, if the remedy is only to be found in building more thoroughly, its adoption may remain doubtful so long as the hazardous way of building and the rates for insuring hazardous property occupy their present relations to each other. Such radical departures from conservative ideas of building, as are herein described, must necessarily find a slow recognition and reach public favor like any other innovation—through small and gradual beginnings—and wait until their merits grow to be regarded as a public necessity.

But, however destructive to the material wealth of the country may be the vast losses of property by fire, they sink completely out of view when compared with the terrible sacrifices of human life that are constantly resulting from unsafe building construction.

Against this fearful consequence of it, humanity can reasonably protest, and claim, for the sake of human welfare, that such structures as hotels, theaters, public schools and all other places of public resort, shall be made invulnerable to the assaults and the horrors of fire catastrophes.

The writer has heretofore declined to make any public statement concerning the experiments herein described, for the reason that he considered they should undergo thoroughly satisfactory tests of severe weather exposures and varying temperateures through a period of time long enough to determine their true and relative value.

In conclusion, it is to be hoped that these experiments may shed enough additional light on the fire-proof building question to make the way easy for reducing re-enforced béton construction to a system that will deserve public confidence and ultimately lead to its common adoption.

DISCUSSION.

Mr. Grant—I would like to ask why Mr. Ward did not build his new shop or bolt works on that plan? He has just built a new shop at Port Chester for making bolts. Why didn't he build his shop in that way?

Mr. Woodbury—The foundation of a straight line engine which runs the screw works is built of béton. (Applause.) The shop in question is his son's—not W. E. Ward's.

Mr. Le Van—Mr. President, I would like to state, in connection with fireproof buildings, that the "Brown building," just finished in Philadelphia from plans furnished by Cabot & Chandler and Amos J. Boyden, is considered fireproof. All the floors and roofs are of heavy planks on wooden girders, the latter being re-enforced by iron plates or beams only where partitions may in future be removed, or where from other causes there may be great weight to support; and in all cases iron so used has been inclosed in solid wooden beams, and both beams and ceiling thoroughly fireproofed by heavy mortar coats on strong wire cloth.

The insurance companies of Philadelphia considered the risk so small that they have insured this building for five years at the rate of fifty cents on one hundred dollars, or at the rate of one-half per cent, the cheapest rate in the city.

The President—The chair will state that the Zoological Museum at Cambridge is constructed in this way, the beams being covered with a fine covering of mortar attached to wire lathing.

Mr. Root—Mr. Chairman, Mr. Ward being a neighbor of mine, I have been somewhat familiar with that house during the whole time of its construction. After it was completed he erected a large flagstaff right in the center of the tower. This staff was supported by iron braces to hold it in place. There came up a very severe thunder storm, and the lightning struck this staff and shivered it into ten thousand pieces. The splinters fell all over the grounds around the house. A short time after that, hearing that the staff had been struck, we went up to the top of the tower to see what damage had been done. We found two or three little splinters of cement. The iron rods in the side walls and floors had served to carry away the electricity to the ground with such ease that no harm was done to the building whatever.

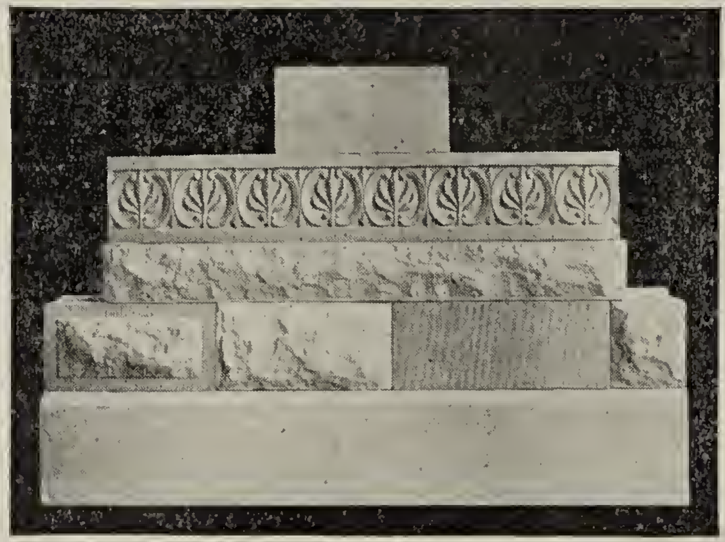
Mr. Weightman—I would like to ask whether any difficulty has been found from dampness in a house with floors and walls of béton, with flues and ducts in them through which moist air will circulate in a wet season?

Mr. Thompson—I rise to ask whether it does not take a long time for the béton flues to change their temperature from cool to warm and the reverse? Their necessary thickness and material, it would be thought, would act to make such changes sluggish and lead to trouble.

Mr. Ward — Replying to Mr. Weightman's question, I would say that at no time since the house has been inhabited (which is now about six years) has there been seen the least indication of dampness in any part of it. I attribute its remarkable freedom from this trouble partly to unobstructed circulation of air through all the walls and the spaces between the floors and ceilings, but mainly to the porous quality of béton, which seems competent to effectually resist any perceptible condensation of moisture. In answer to Mr. Grant's question, I have to say that the Port Chester Bolt Company, like many others entering upon a new enterprise, could not determine how much space they would require for their business short of one or two years' experience, and the building was urgently needed within less time than it would take to construct it of béton. Furthermore, the risk of the building and business from fire is so trifling, in comparison with that of most other manufacturing pursuits, it was not considered necessary to incur the additional cost required to build the factory of béton, although every part of it in the least exposed to dangerous fire risk, as well as the foundation bed of the engine, was constructed of re-enforced béton. To Mr. Thompson's question as to the time required for heating and cooling the house, I would say that a change of temperature in the house is sensibly felt within two hours after fire in the furnace has been started, and it takes altogether about five hours' time to bring the temperature of the space above the first floor up to 68 degrees, when the outside temperature ranges at about 30. To cool off the house rapidly, if necessary, it only requires, after the fire is let down, the closing of the dampers that control the circulation of the heated air and the opening of several windows to admit and discharge a large volume of outdoor air. This will in about two hours reduce the temperature of the radiating surfaces from ten to fifteen degrees. Hence there is no serious discomfort experienced from the length of time needed for heating the house nor from reducing the heat when desired.

CONCRETE, THE MODERN STONE.

Of all the building materials ever produced in the world, concrete is the most universal in its application as well as the most durable and least expensive material used in building construction. With proper care and handling, concrete is capable of yielding the most beautiful ornamental work known to the builder's art at a cost of production which defies competition. Its use may be traced back to the early days of civilization, and while its value par se has been recognized, its practical application has been hampered through lack of proper tools to handle it. We reproduce herewith a few striking examples of the results which have been achieved in the moulding of concrete building blocks by machinery.



Plain and Ornamental Concrete Blocks.

The Century Cement Machine Company of Rochester, N. Y., are the pioneers of the production of simple, practical and durable machines for the making of the greatest possible variety of cement building blocks and ornamental parts, such as sills, coping, lintels, pillars, capitals, bases, pilasters, etc. The illustrations which we reproduce herewith give an idea of the vast number of ornamental designs that can be produced with the simple machinery of the Century Cement Machine Company. This company has realized as a basic principle in the production of concrete blocks the fact that variety is necessary in order to relieve the monotonous effect produced, by making an entire building of blocks having the same design, and their constant effort has been to produce as large a number of natural forms of rock faces as possible, in order that the contractor may build a structure having as great a variety as natural stone with no added expense beyond the primary cost of the face plates needed to produce the designs. Even this cost has been reduced to a minimum.

Concrete Column, Cap and Base.

Their latest achievement is in the production of moulds for the making of bases, columns and capitals by the use of which the most striking and stately architectural effects can be produced entirely of concrete and at a cost which would be totally prohibitive were it necessary to use natural stone.

The durability of these concrete structures is beyond question and their hygienic value is being appreciated more and more. These cement structures are not only cooler in summer, but require far less fuel to heat them in winter and are dry and airy as compared with natural stone structures, owing to the air spaces in the blocks, which permit of a free circulation in the walls everywhere.

Salem, Mass., Aug. 31, 1905.

Editor of Cement and Engineering News:

Concrete construction is making great headway in this vicinity. The masons are taking note of this and are beginning to fear that it will displace their own trade in the near future, as concrete construction has so far taken much work out of their hands.

The big plant of the United Shoe Machinery Company in Beverly is built entirely of concrete. Had it been constructed of brick it would have given many masons a long and profitable job. The new A. C. Lawrence factory, in Peabody, is also being built of concrete. Part of the Salem sewerage system and a number of sidewalks about Salem are of the same material and contractors are even figuring on building foundations and chimneys of houses. All of this work takes so much from the masons. Most of the concrete labor of concrete construction is done by unskilled labor.

It looks as if there would be a big development of concrete construction in Salem and vicinity, for contractors have lately begun to cut down two big hills in order to get out trap rock, and in all four hills are now being worked. Automatic machinery may be had for making concrete bricks, and rough concrete work, such as foundations and sidewalks, may be largely done by unskilled help, aided when directed by competent bosses.

The masons of Salem and vicinity have for some time enjoyed an eight hour day at $4 per day pay, and have been strict in regard to the work done by hod carriers and apprentices. But some of them now see a formidable rival to their craft in the new and cheap concrete construction.—George Behler.

JOHN WANAMAKER'S JUDGMENT.

John Wanamaker says in Judicious Advertising: "Advertising doesn't jerk; it pulls. It begins very gently at first, but the pull is steady. It increases day by day and year by year, until it exerts an irresistible power."

A high speed railway is to be constructed between Brussels, Belgium and Berlin, Germany, via Cologne. The minimum speed of trains will be 120 miles per hour. The Belgian government will contribute $11,250,000 towards the construction of the road, which is now under way.

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CHICAGO, SEPTEMBER, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

HOLLOW CONCRETE BLOCK BUILDING CONSTRUCTION UNDER CHICAGO ORDINANCES.

The city of Chicago has enacted numerous ordinances regulating the construction of buildings within its corporate limits. These ordinances divide the buildings into classes numbered from 1 to 8. Class 1 includes every building used for the sale, storage or manufacture of merchandise, excepting department stores and sale stables covering a ground area of over 500 square feet. Any one or two-story building falling under Class 1 may be constructed with a self-supporting steel frame, with floor that will carry a live load of 100 pounds per square foot. The exterior wall may be constructed of expanded metal with Portland cement mortar plastered on both sides of the metal lath, the completed wall to be not less than 1 1-3 inch thick. Reinforced concrete frame as strong as the steel frame may be substituted, the mortar to consist of portland cement and torpedo sand.

Class 3 includes every building used as a family residence; also every building used for stabling purposes occupying less than 500 square feet ground area.

Class 6 includes every tenement or apartment house or any house or portion thereof which is used as a home or residence for two or more families living in separate apartments. The thickness of the enclosing walls under Class 6 must be as follows: For a one-story building, basement, 12 inches, first story 8 inches thick; for a two-story and basement, basement wall, 12 inches thick, first story 12 inches thick, second story 8 inches thick.

Under Class 3 the enclosing walls for a one-story and basement building; basement walls, 12 inches thick; first story, 12 inches thick; for a two-story building, basement 12 inches thick; first story 12 inches thick; second story 8 inches thick.

Under Section 961 of the Building Ordinances of the City of Chicago, designated as "Moulded Hollow Concrete and Hollow Tile Block," provides: Moulded hollow concrete blocks or moulded, hollow, vitrified, clay building blocks of the full thickness of a 10-inch wall may be used wherever 8-inch walls are called for by this ordinance and such blocks may also be used wherever 12-inch brick walls are called for in this ordinance, under frame cottages and 2-story Class 3 and Class 6 buildings.

It will be seen that there is no ban on concrete building block construction on a certain class of buildings in Chicago, there being no restriction on one-story, hollow concrete block buildings, provided the basement walls are 12 inches thick and the first story wall 8 inches thick. Under both Classes 3 and 6 for two-story buildings, hollow, concrete building block, 10 inches thick, may be substituted wherever an 8-inch solid brick wall is called for; a 12-inch hollow concrete block may be used instead of a brick wall of equal thickness.

All plans and specifications must be submitted to the Commissioner of Public Buildings and approved by him before the erection of the building can be commenced.

Inspectors, under the Commissioner, are required to visit and inspect the building to see that the plans and specifications are honestly carried out, that only good, sound materials are used.

It is reported that the Lehigh Portland Cement Company has purchased 1,000 acres of limestone and clay lands near Belleville, Ontario, upon which a large Portland cement plant is to be erected in the near future.

The United States Geological Survey statistics show that 10,679,728 short tons of sand were produced in this country in 1904, valued at $5,748,099. Of this quantity, 1,783,749 tons, valued at $1,783,749, were used for building purposes.

THE ONTARIO POWER COMPANY. has constructed a power station on the Canadian side of Niagara Falls. The first section of the building is now completed, one turbine 5,700 H. P. capacity has been installed, designed by J. M. North of Heidenheim, Wurtemberg, Germany. The turbines will operate under a head of 175 feet and will make 187½ revolutions per minute. Some 480,000 H. P. is to be installed. Electric power will not only be distributed in Canada, but likewise to Rochester, N. Y., via Lockport, Medina and Albion, and other intermediate points.

A NEW BUILDING MATERIAL.

So many uses are found for concrete in building operations that new applications of this material in order to secure permanence and economy of construction are being constantly recorded. One of the latest is from Liverpool, where dwellings made of concrete are being erected by the corporation for the artisan classes, the idea being that the cost of erection can be reduced to a point that will enable rooms to be rented for a shilling a week. The material used consists of concrete blocks formed from waste crushed clinker obtained from the city refuse destructor plant, which ordinarily is employed in making concrete slabs for crosswalks and in pavement foundations. The structure of these slab or concrete dwellings is reinforced by steel framing, and they appear eminently strong and durable.

The cost of brick dwellings recently erected in Liverpool was in one case about $17,000, and in another about $11,000, for a block, while the estimated cost of a concrete block was but $6,000. In the actual erection, however, there was required a new and necessary plant which brought the cost to over $20,000, but the actual amount involved in the building was but $15,000. The engineer in charge is confident that with further experience the new method will be found most economical, and desires to erect five additional blocks. If dwellings for the masses can be provided at a substantial reduction on present costs, the use of concrete is bound to have an important influence on sociological conditions.—Harper's Weekly.

ENFIN!

The Odd Fellows' building at Clio, Iowa, will be constructed with cement brick.

ENFIN? Examine the obelisk.

Ida Grove, Iowa, is about to erect its city hall building, which will be constructed with concrete-building blocks.

ENFIN! You need it in your business.

Negotiations for a second Portland cement plant at Demopolis, Ala., are under way.

ENFIN! Inquire about it.

A new Portland cement plant has been projected at Wellston, Ohio.

ENFIN! It is not a breakfast food.

A new concrete products factory has been organized at Pontiac, Mich.

ENFIN! Looks like Greek.

John H. Logan, who is promoting a Portland cement plant near Iola, Kansas, has gone to New York to finance the company.

ENFIN??!!!

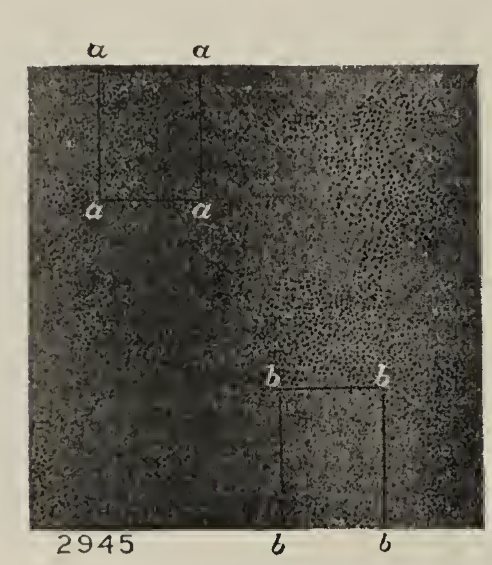
ENFIN? Why, of course.

MEASURING VS. WEIGHING.

Almost all manufacturing processes demand some method of determining mass. The most important commercial properties of mass are cost of purchasing and the chemical and physical results obtained from bringing different predetermined masses into intimate contact.

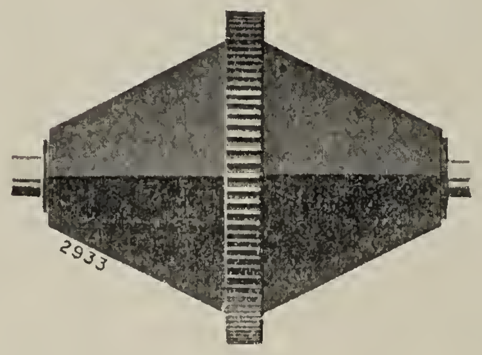
The usual methods of determining mass are by weight or by measurement, and both are open to objections. Impurities occur which can only be allowed for by chemical analysis, and where the impurities vary, exact results can only be obtained by continually analyzing at close intervals. When this is done mass can be determined very closely by weight, but beside the obvious objection of cost, generally out of all proportion to the importance of the result accomplished, there are mechanical objections to weighing which will be referred to later.

Measurement of volume may be inaccurate from impurities the same as weighing, and also from the pressure of voids. Most materials are handled in a crushed or pulverized state, so that the proportion of voids is large. If, however, the voids can be kept constant or nearly so, this objection is obviated. This is a physical problem and can be solved by mechanical means. An ordinary crusher will break materials so that the amount of voids in even relatively small samples are remarkably uniform. Furthermore, the presence of absorbed water does not swell the dimensions, but simply fills the voids, causing no inaccuracy. In weighing, however, such absorbed water would be counted in as so much active material, unless the materials were previously dried or this moisture determined and allowed for, and might seriously affect the value of the finished article and its cost of manufacture.



2945

(Fig. No. 2945.)



(Fig. No. 2933.)

2945

(Fig. No. 2945.)

Where two or three materials are to be mixed it has been the custom to weigh a considerable proportion of one and place with it the required proportion of the other, the whole forming a batch, which is then mixed by tumbling about in some form of agitating device. The weights are usually set at predetermined positions on the scale beams, and where the materials are very finely divided it is difficult to stop the flow from the supply spout in time to prevent what is often a serious error. Many weighing devices, both automatic and hand operated and accurate in themselves, fail because of this difficulty with the supply gates.

The economy of weighing increases with the size of the batch, and regardless of size it is possible, though expensive, to insure that the proper proportions of each material enter into the batch.

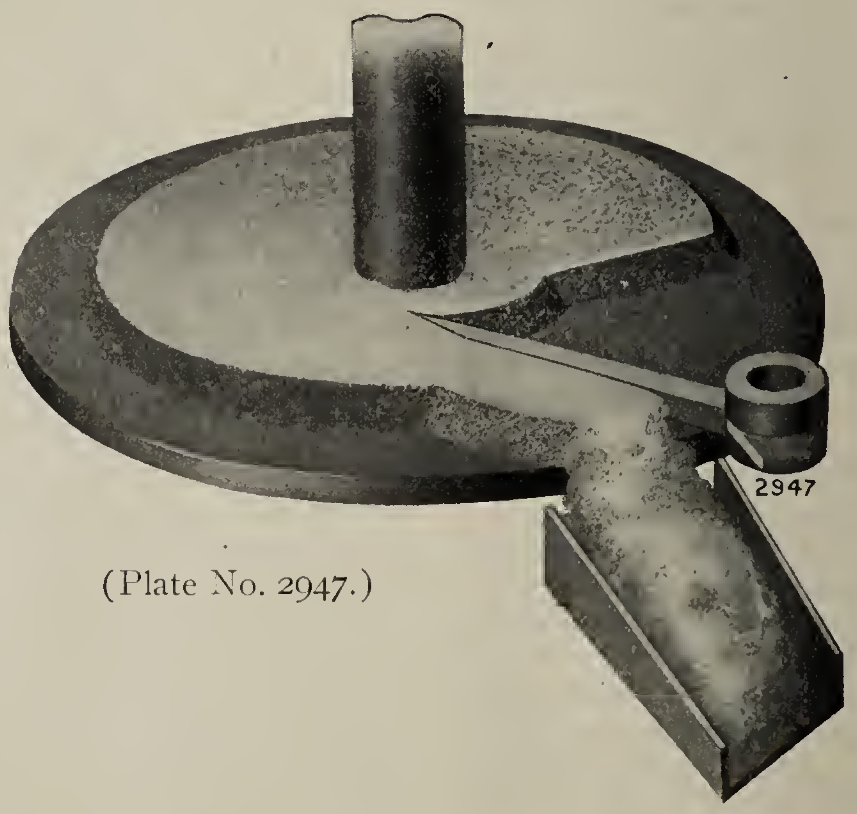
It is not so easy, however, to be sure that after the batch is mixed each part of the batch is like every other part, or that the mass is uniform. The mixing apparatus may be a tumbling barrel or a paddle trough, but all such apparatus depends on the haphazard transfer of one portion of the batch to another, a large number of such transfers being expected to make the mass uniform. There is nothing, however, to absolutely insure this.

If the mass is not uniform and the poorest part is rich enough, then the rest of the batch is too rich, and valuable ingredients are being wasted. Also the larger the batch (and the more economical the weighing) the more mixing is required and the less uniform the mixture. This leads to the conclusion that the materials should be proportioned and placed together in infinitesimal quantities, and by logical sequence the proportioning should be continuous.

Weighing by any method is intermittent, but measuring can be done continuously, provided it be true and accurate measurement and not merely an average of errors. To be continuous it is necessarily automatic and therefore economical.

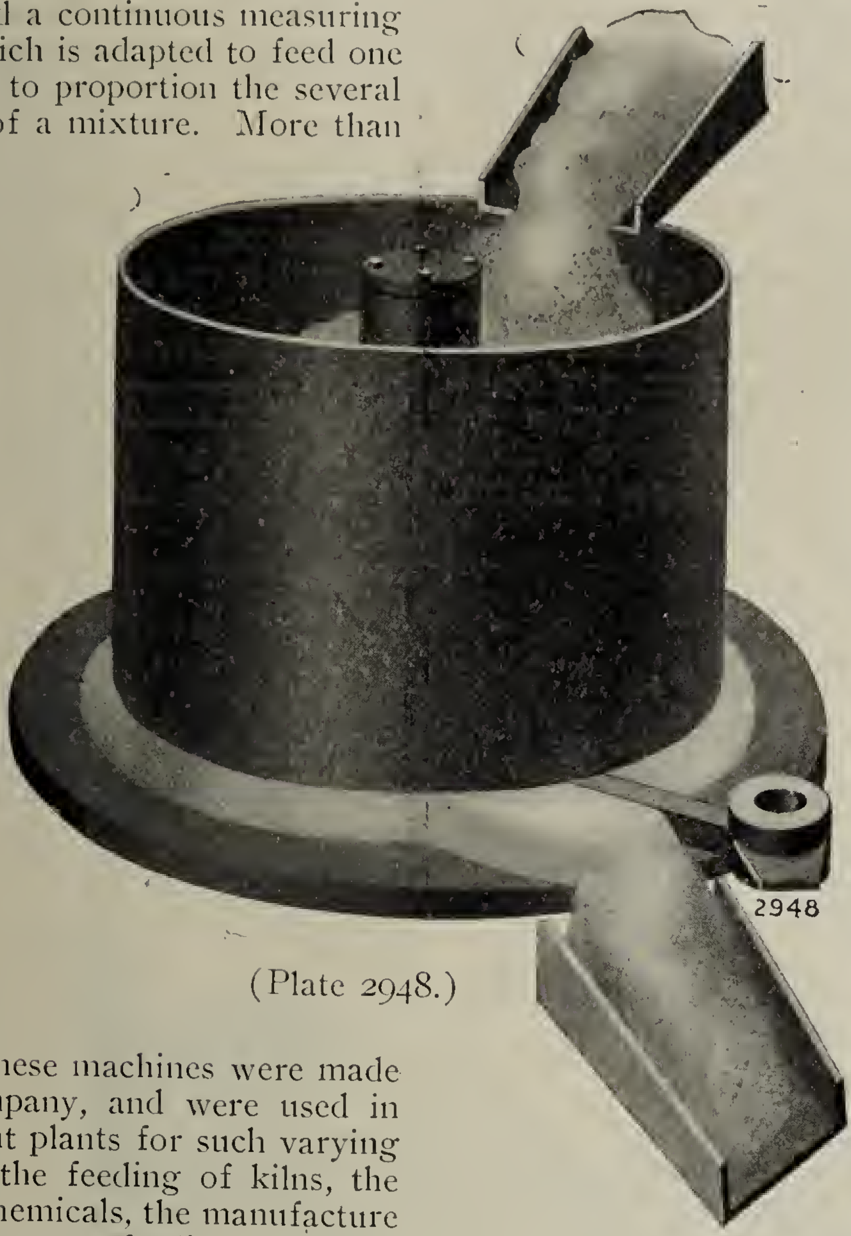
The presence of voids cannot be avoided with crushed materials, but the proportion of voids in any one material crushed in any one crusher is remarkably uniform, and once determined and allowed for can be neglected. Means must be provided, however, to prevent uneven packing, especially with the finer materials.

Where materials are to be fed to kilns or furnaces, the intermittent introduction of cold materials from weighing machines, or even a continuous, but slightly irregular, feed may cause a deterioration of the product,



(Plate No. 2947.)

and in any event cuts down the capacity of the apparatus, sometimes as much as 50 per cent, besides injuring the furnace itself. To meet the urgent need of such apparatus in the works of the Solvay Process Company, Mr. E. N. Trump, chief engineer of that company, devised a continuous measuring machine, which is adapted to feed one substance or to proportion the several ingredients of a mixture. More than a dozen of these machines were made for this company, and were used in their different plants for such varying purposes as the feeding of kilns, the mixture of chemicals, the manufacture of coke briquettes, feeding of rocks, the making of concrete, etc., and handled material of 6 inch cube dimensions to the finest of powders, both wet and dry. In actual service trial they were so successful that Mr. Trump protected his rights and the machines are now being marketed by the Link Belt Engineering Company, Philadelphia.



(Plate 2948.)

The Trump Measuring Machine consists essentially of a horizontal revolving table, on which the material to be measured rests, and a stationary knife set just above the table and pivoted on a vertical shaft just outside the circumference. This knife can be adjusted so as to extend the proper distance into the material on the table, at each revolution of which it peels off a certain amount, which falls over the table edge into the chute. This is shown by Plate No. 2947.

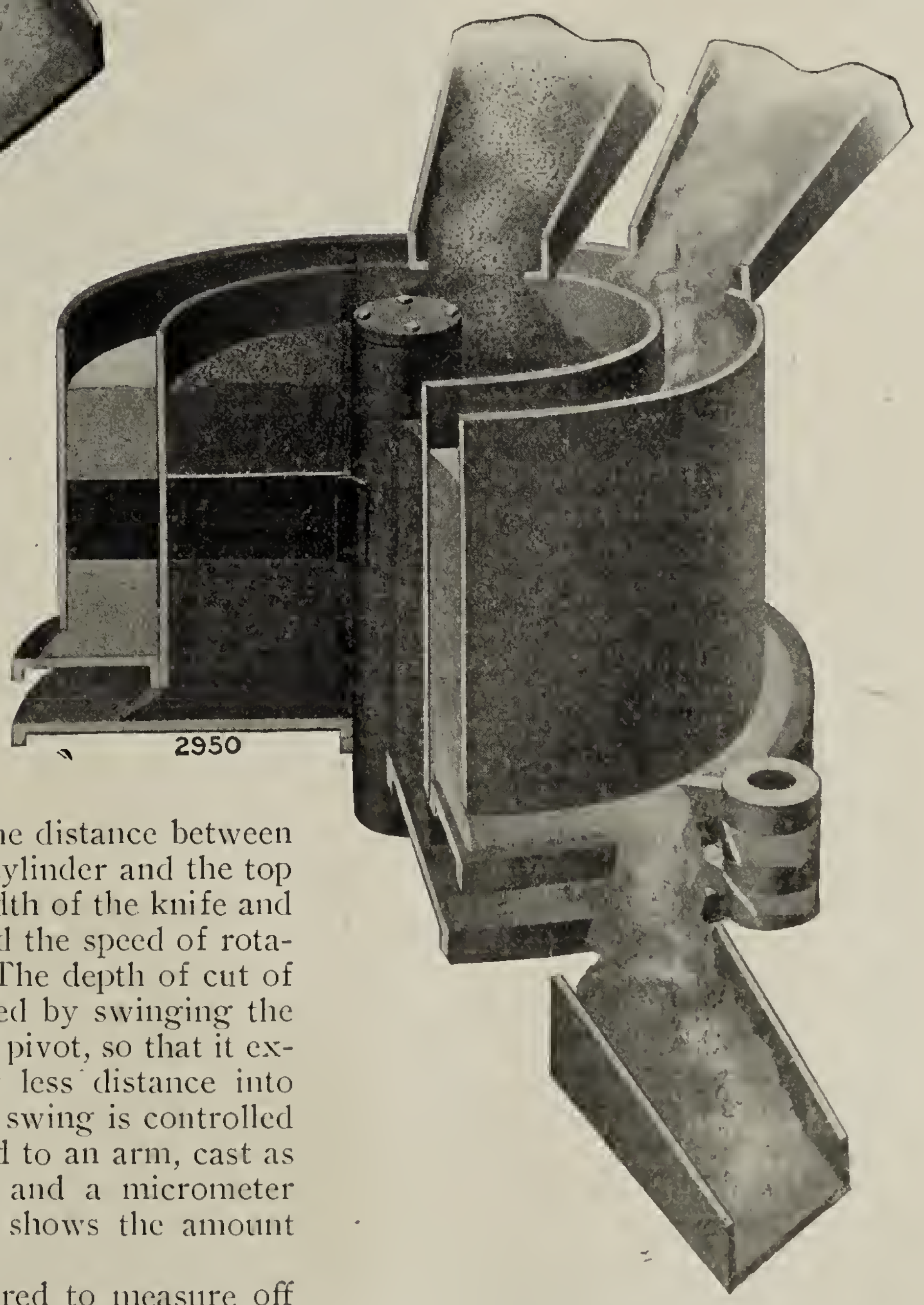
As the material is peeled off by the knife, it must be replenished, so that the pile on a certain part of the table is filled in to approximately the same shape and size by the time it has revolved so as to be again presented to the knife. This is accomplished, as shown by Plate No. 2948, by placing a bottomless storage cylinder, somewhat smaller in diameter than the table and revolving with it, with its lower edge a short distance above the table, so that the material flows out from under the edge of the cylinder and assumes a conical shape.

The factors determining the amount measured off are the distance between the bottom of the cylinder and the top of the table, the width of the knife and its depth of cut, and the speed of rotation of the table. The depth of cut of the knife is adjusted by swinging the knife around on its pivot, so that it extends a greater or less distance into the material. This swing is controlled by a screw attached to an arm, cast as part of the knife, and a micrometer scale with pointer shows the amount of movement.

Where it is desired to measure off and mix two or more materials, the machines are made with two or more tables, set one above the other, and mounted on the same spindle so that they revolve together, each table having its own storage cylinder above it, and the cylinders being placed one within the other, as shown by Plate No. 2950.

For each table there is a knife, with its own adjusting mechanism, which allows the user to vary at will the percentage of each material in a mixture, and, as the materials flow together constantly and regularly in small streams as they drop down the common chute, each infinitesimal amount of one ingredient is accompanied by the proper amounts of the other ingredients, and the particles become intimately mixed.

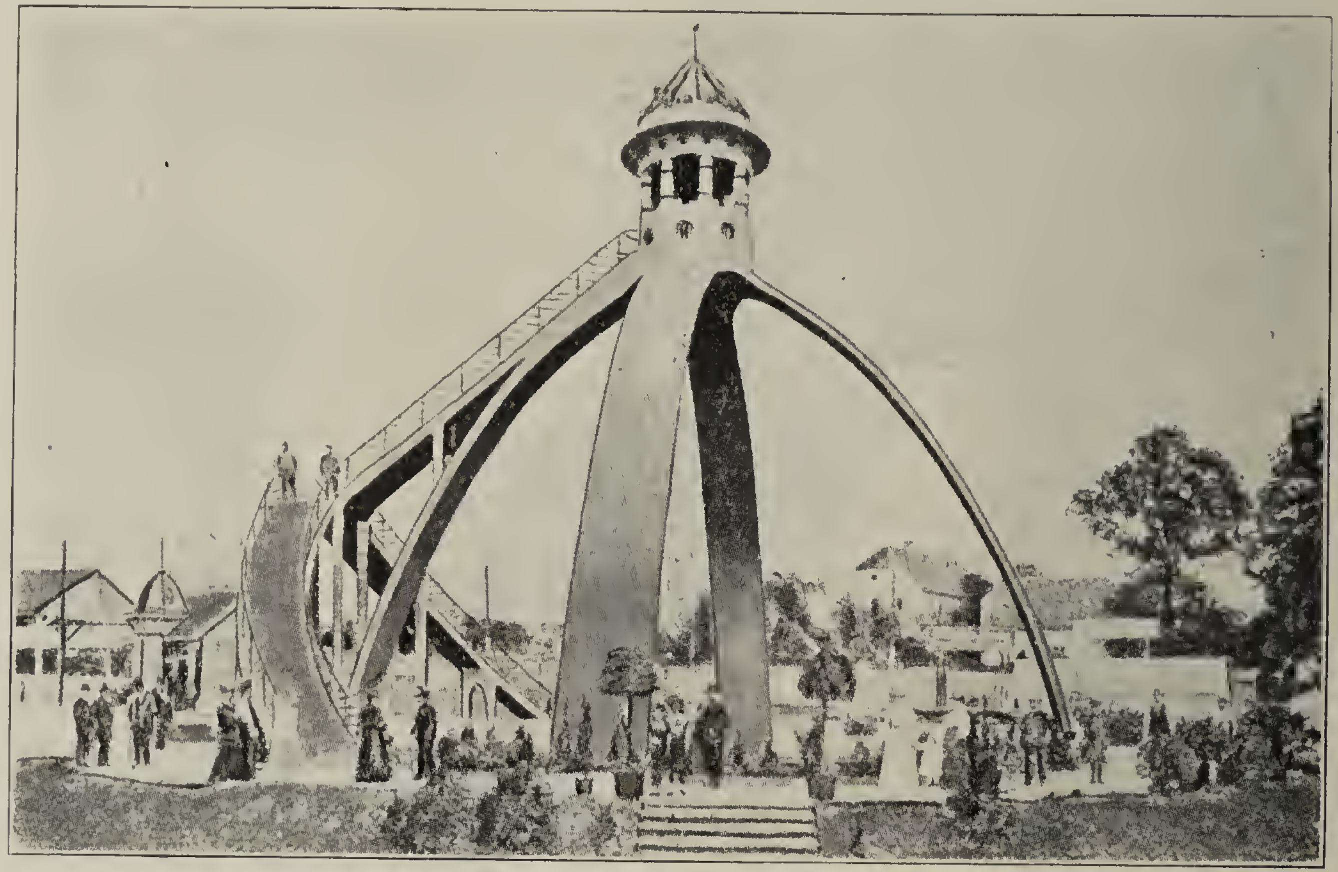
In feeding materials to the storage cylinders of these machines a conveyor can be employed; they can be delivered by gravity from a storage bin or they can be shoveled; and it is only necessary to see that enough is kept in the storage cylinders so that the amount which the knives peel off will be constant. With some finely powdered materials, which flow very freely, it is necessary to place feeding seals at the top of the storage cylinders to regulate the density and pressure on the material below, so that it



(Plate No. 2950.)

will not pack or flow out at the bottom too rapidly and flood the table.

The tables and storage cylinders are all mounted on and driven by the same center sleeve, which is carried on a dirt-proof step bearing with hard bronze and steel washers and proper oiling device. The lowest table has a bevel gear cast on the under side, and is driven by a pinion mounted on a countershaft. The casings of the machine are made dust proof to avoid any possibility of leakage or pollution of the air by finely powdered materials, and the whole is mounted on a substantial base, thus making the machine entirely self contained. The countershaft can be connected up to an electric motor by direct gearing or can be driven by means of a belt and pulley.



Reinforced Concrete Exhibit Trade and Industrial Exhibition, at Gorletz, Germany.

A UNIQUE REINFORCED SKELETON CONCRETE ARCH.

The lower Selesian Trade and Industrial Exposition at Gorlitz, Germany, now under way, contains numerous exhibits in reinforced concrete construction. We reproduce an illustration from Tonindustrie-Zëitung of a skeleton arch or dome, constructed in reinforced concrete 43 feet 9 inches high, with a cupola above the arch. A double stairway using one-half the arch meets at the foot of a single stairway leading to the cupola. The arch spans a basin containing a fountain. The structure is the exhibit of the Lolat-Eisenbeton Company of Breslau, which designed and constructed the exhibit to show the wide range of application of reinforced concrete construction.

A concrete shingle factory is under construction at Waterloo, Iowa; $25,000 capital is to be employed in the production of these shingles.

THE BRICK INDUSTRY IN THE UNITED STATES.

Few people have any definite idea of the production of brick in this country. The United States Geological Survey has just published a tabulated sheet on this subject, from which we abstract the following: "Forty-eight states produced in 1904 8,665,171,000 common brick, valued at $51,768,558, the average price being $5.97 per thousand; the highest price being obtained in Wyoming, where 3,881,000 bricks were sold at $8.92 per thousand; the next highest price of $8.17 was in Delaware; the lowest prices ruled in Kansas, where brick was sold at an average of $4.39 per thousand. The production of front brick was 434,351,000, valued at $5,560,131, or $12.80 per thousand, while the output of fancy or ornamental brick was $845,630. The total value of the brick produced in the United States outside of paving brick was $58,174,319."

Inasmuch as the concrete block is competing with the brick industry, usually at an advantage in price, these figures show the vast field that is opening up to the concrete block industry in this country.

RECEIVER SALE OF THE HECLA CEMENT CO.

The Detroit Trust Co., receiver for the Helca Portland Cement and Coal Co., will offer the property of said company at public sale, at an upset price of $750,000, at the court house at Bay City, at 2 o'clock, p. m., September 27, 1905. In the event of no bid being received for the property as a whole, it will be offered in groups or parcels. A report of such division is to be prepared in advance and filed with the clerk of the circuit court at Detroit, at least fifteen days before the date of sale, which report will be open to the inspection of prospective bidders. Should there be no bids received, either as a whole or in parcels, aggregating $750,000, the sale will be adjourned. Each bidder must deposit a certified check for twenty per cent of his bid before his bid will be received.

The property was first offered for sale on June 7, 1905, at an upset price of $950,000. When no bids were reserved, it was again offered on June 18th—upset price of $750,000. No bids were reserved.

CEMENT PRODUCTION IN 1904.

The total production of Hydraulic cement in the United States in 1904 was 31,675,257 barrels, valued at $26,031,920, against 29,889,140 barrels of Hydraulic cement in 1903 valued at $31,931,341, showng a gain of 1,776,117 barrels over 1903 and a loss in value of $5,899,421.

Of the total amount of cement manufactured in the United States in 1904, 26,505,881 barrels were Portland cement, valued at $23,355,119; 4,866,331 barrels were natural-rock cement, worth $2,450,150; and 305,045 barrels were slag or Puzzolan cement, with a value of $226,651.

Contractors throughout the country from the Atlantic to the Pacific are pressing for earlier deliveries of portland cement. The mills are doing their best to keep up with the orders. The country, viewed from the cement industry, is prosperous.

The Iola Portland Cement Co. is flooded with orders.

DEFECTIVE SIDEWALK DAMAGE SUITS IN CHICAGO.

During the past seven years judgments for more than $5,000,000 have been rendered against the City of Chicago in personal injuries damage suits. The great majority of these suits are based upon injuries received on defective wooden walks. The five million dollars does not include the cost of defending these suits. Over 800 new damage suits were brought in 1904. The present year promises to exceed that of 1904 in the number of personal injury suits brought against the city.

There are miles of rotten, shaky and broken-down walks in various parts of the city and their condition affords a plausible basis for any damage claim, whether it be honest or fraudulent. As a means of protecting the city against this constant and heavy drain upon its revenues, a campaign having as its object the abolition of wooden sidewalks in Chicago with a view to bringing about a cessation of damage litigation against the city is likely to result from a letter on the subject sent to Commissioner of Public Works Patterson by City Attorney John F. Smulski. Mr. Smulski has prepared a report after an exhaustive personal study of sidewalk conditions in the city.

Cement Walks Avoid Damages.

According to court records there has never been a judgment for damages against the city for injuries suffered by any citizen on a cement sidewalk.

For years it has been the policy of the city to discourage the building of wooden sidewalks. Ordinances have been passed barring them from extended districts. A year ago an ordinance was passed forbidding their construction in any place where less than three feet of filling was required to bring the sidewalks up to street grade.

Stone or Concrete Mostly Used Now.

In consequence cement walks have increased every year. Either stone or concrete is the material for at least 70 per cent of the new walks in Chicago this year. The remainder are built of cinders, with occasionally a wooden walk.

City officials have estimated that Chicago laid $1,928,834 worth of sidewalks last year, divided as follows:

	Miles.	Est. cost
Cement walks	292.35	$1,449,448
Cinder walks	215.17	373,776
Plank walks	45.75	105,610
Total	553.27	$1,928,834

Robert Redfield, attorney for the board of local improvements, who has charge of legal matters in connection with special assessments for sidewalk work, urges destruction of wooden sidewalks.

"My cure for damage suits is to tear up the wooden walks," said Mr. Redfield to-day. "I would replace them with cement where the property is valuable enough to stand the assessment and with cinders in the poorer districts."

Using city work last year as a basis for computation, concrete walks cost 93 cents per lineal foot for six-foot walks, cinder walks 32.9 cents and plank walks 43.72 cents. The prices given show a decrease of 3 per cent for cement walks and of 11.51 per cent for cinder walks, with an increase of 11.73 per cent for plank walks over prices prevailing two years ago.

Smulski Letter to Patterson.

Mr. Smulski's letter to Commissioner Patterson was as follows:

"Dear Sir—I wish to lay before you, as the head of the department of public works, the question of the defective and dangerous condition of many of the sidewalks within the limits of our city, believing that you will take some action in this matter through the ward superintendent, whose duty, I believe, is to look after the physical condition of their respective wards. While the number of damage suits against the city of Chicago for personal injuries sustained on broken and defective sidewalks and streets has slightly decreased in the last two years, the number of new suits brought is still large enough to be a menace to the tax paying public. In 1904 nearly 800 damage suits were commenced against the city and at the end of 1905 at least as many more will have been brought.

Urges Improvement of Walks.

"The city attorney's office uses every effort to keep down the average amount of damages recovered, and many of the cases when reached for trial are successfully defended, but this department is powerless in the matter of improving the physical condition of the streets and sidewalks; neither can it prevent claimants from filing suits whether for honest or dishonest claims and it costs money to fight lawsuits.

"In the last six or seven years it has cost the taxpayers of our city over $5,000,000 in judgments for damages, and at present it costs the city hundreds of dollars every year to defend these lawsuits. This money judiciously expended would keep in proper repair every sidewalk and street within the city limits.

"Street accidents are not so numerous, although usually severe, especially where drivers are thrown from their seats to the street below owing to the wheels of their wagons running into deep holes and ruts made more dangerous by insufficient lighting. As many as twelve cases of instant death have occurred during the last two years.

Where Majority of Cases Originate.

"The real danger, however, lies with the defective sidewalk and the greater number of claims and suits begun against the city emanate from this cause. They are more dangerous and frequently tainted with corruption, fraud, perjury and subornation of perjury. The present existing conditions of the streets and sidewalks are an incentive to fake agents and claimants and work hand in hand with them. Recently I took a trip through the different sections of the city and personally inspected a great many miles of sidewalks. The conditions, as I have found them, are an outrage upon a civilized community, dangerous and disgraceful, a menace not only to life and limb, but to the taxpayer who is called upon to foot the bills. Ambulance chasers and personal injury agents make it their business not only to follow up bona fide cases, but owing to these conditions are able to trump up wholly fraudulent claims. It is only necessary for them to supply the plaintiff or claimant, the defective sidewalk is so plentiful, that the most fastidious claimant can find any number and variety of broken-down, rot-

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JULY				SEVEN MONTHS ENDING JULY			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	2,200	$ 17	67,200	$ 215	6,214,856	$ 20,846	6,861,200	$ 21,651
Belgium...........	15,610,793	52,143	2,311,400	6,835	81,135,082	242,868	66,725,115	209,678
France............	1,485,562	5,005	....	....	10,534,355	35,048	4 026,300	14,302
Germany..........	18,591,078	67,267	13 280,767	41,562	116,481,022	395 051	82,979,373	271,845
All Other Europe	.... .	....	....	......	1,790,115	6,059	240,659	609
British North Am.	....	....	700	6	81,560	417	127,660	1,368
Other Countries..	4,700	21	....	....	1,011 948	2,928	447,060	1,613
TOTAL...........	35,694,333	124,453	15,660,067	48,618	217,248,928	703,217	161,407,367	521,066
Domestic Exports of Cement, bbls	80,306	119,005	111,618	145,808	235,813	385,243	589,469	792,755

* There were 11,635 227 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in July, 1904, valued at $37 972, against 7,771,313 lbs in July, 1905, valued at $26,048.

For 7 months ending in July, 1904, there were 62,513 tons of asphalten imported in the United States, valued at $267,645, against 64,552 tons imported in 7 months ending July 1905, valued at $277,229.

ten and shaky sidewalks in any part of the city.

"While it is true that your department has no power to levy assessments for the purpose of building new sidewalks, nor have you sufficient funds at your disposal to make necessary repairs; it is, however, in your power at least in part, to protect the municipality and the taxpayer from the dishonest and designing claimant and personal injury agent.

"You have at your disposal in every ward a ward superintendent and a number of ward employes whose duty it is to look after the physical condition of the streets, sidewalks and alleys. An order from you upon these city officials to tear up and barricade every defective sidewalk found in their respective wards when properly enforced will prevent pedestrians from walking upon them. It will remove the opportunity for designing claimants to use the existing conditions as a basis for a claim or a lawsuit.

"I trust that you will devote to this question such time and attention as your numerous duties will permit, and I hope that as a matter of protection not only to the citizen who uses these sidewalks but also to the taxpayer, you will take this matter up at once and issue a general order to your department instructing the ward superintendents to tear up and barricade every defective sidewalk found within their respective wards."

CEMENT IN NASHVILLE.

Five or six years ago the cement business in Nashville amounted to practically nothing; now, it is a big thing in the city's business. The cement sidewalk was then an untested proposition, and its value was usually scoffed at. Cement block houses were unknown. Such a structure as the concrete elevator of the Nashville Warehouse & Elevator Co., which is now going up, was undreamed of. The many other uses to which cement is now put were not thought of.

Now the city has over a dozen firms who do a large cement business, and the number is constantly being added to. Cement piers for bridges and for railroad trestles, cement for house material and sidewalks, have opened a new field for the cement man. In Cincinnati an 18-story skyscraper is being built upon the same plan as the concrete grain elevator in Nashville, referred to above. It will not be a concrete finish, but will be veneered with some more expensive material. Tile veneered houses are becoming numerous in Cincinnati, the houses being constructed of concrete and veneered with thin, sober-colored tiles.

Among the many firms doing a concrete business in Nashville are the Nashville Builders' Supply Company, W. T. Hardison & Co., E. T. Lewis & Co., Cumberland Cement Company, John Oman, Jr., Nashville Roofing & Paving Co., Cooper & Ferguson, Leseuer & Tarpley, Cash & Rogers, G. Lea & Co., Granitoid Construction Company, W. M. Leftwich Company, New Era Company, and several others.—F. N.

RULES FOR CONCRETE.

By Charles P. Chase, C. E.

A paper read before the Iowa Engineering Society.

There are many rules for concrete—some good, others unreliable. What is good in one situation is not always so in others. The engineer must carefully study his materials and the use to which it is to be put. The same mixture cannot be used for a retaining wall and a reservoir wall. This is, however, done at times in Iowa.

Preparing the Concrete.

"In preparing concrete the sand and cement should be mixed dry first; then add water, and then subsequently add the crushed stone, gravel or whatever the aggregate is to be, and then thoroughly mix the mass. All mechanical mixing also, by whatever machine, should follow this rule. It should be transferred in as large quantities as possible to the work in dump wagons, wheelbarrows or carriers, and dumped as nearly as possible in position in a 6-inch layer, as shoveling and rolling tends to roll out the stone, thereby making an excess of aggregate at one point and pure mortar at another. It should then be tamped to an even surface by a smooth iron tamper, preferably square, with 6 to 8 inch square surface, and weighing 25 to 30 pounds. Do not attempt to deposit concrete under water when there is any way to avoid it. If used in this way at all place in coarse jute bags and deposit them in layers as close together as possible and tamp hard; this prevents the loss of the strength of the concrete, and enough cement comes through the bags to bind the mass.

"The proportion of mortar to aggregate will vary according to materials; in screened, crushed stone it will require nearly one-half mortar to fill voids and give the slight excess desirable.

"Where the rock is used crusher run the percentage of voids is only about one-third, and if the material is clean and all stone the result is excellent and to be desired; but let me sound a note of warning here and say that crusher run, to the quarryman, quite frequently means everything in his quarry that can be got on a shovel. This means additional worry for the inspector. If you are doing your own crushing in clean rock, however, you will get excellent concrete. Many of the railroads and the United States government have experimented in this line and recommend crusher run stone.

"No rule for composition of concrete can be laid down that will fit all cases, but we have found the following successful:

"For arches and water tight work, 1 cement; 1 sand; 3 stone.

"For heavier walls, requiring bulk and strength, but a lesser degree of permeability, 1 cement; 2 sand; 4.5 stone.

"For ordinary uses in abutments, heavy walls, paving, foundations, etc., 1 cement; 3 sand; 6 stone.

"A good common concrete in gravel is, 1 cement; 2 sand; 5 gravel.

"For curbing we have obtained better results by using 1 to 3 or 1 to 4 of torpedo sand than by making a weaker body and trying to face the work by plastering molds with a rich plaster. From several years' experience in all kinds of concrete work and the examination of the leading structures in this country the writer is very much down on facing concrete by plastering forms and is decidedly in favor of getting results by using smooth forms and a mixture of about 1 cement to 3 of torpedo sand.

"Bulky walls, piers and abutments are often cheapened by dropping in large stone in layers in the center of the work; and where stone is cheap and hard there is no objection, if that is what you are paying for.

"Concrete has a great advantage over rough masonry for all work required to be water tight, as the mortar fills in all intersticies and prevents the passage of water. The recent experience with the Jerome Park reservoir, New York, would have been avoided if the reservoir wall had been concrete.

"The cost and often almost impossibility of ramming concrete to a solid mass is a weighty argument in favor of wet concrete. After considerable experience in this line and examination of many works of magnitude we conclude that a mixture wet enough to pour is the thing. Hand tamping depends for efficiency on the 'location of the boss' and the 'personal equation' of the tamper.

"With good materials for concrete, the next question is a good mix. To accomplish this, every particle of aggregate, large or small, should be coated with cement. The amount of water should always be under control, and the batch should be visible to the man in charge.

"Since the advent of concrete a large number of mechanical mixing devices of varying usefulness have sprung into use—the drum mixer, the cylinder, the dromedary, the cubical, the continuous batch, the separate batch, the trough and the gravity, each with a great variety of patterns and patents. In nearly all large works at present the mixing is done mechanically and is certainly an advance over hand mixing. Of course we occasionally have to fall back on the shovel, but it is the exception, and the machine doesn't shirk or skimp on labor.

"What mixer is best will often depend on environment, but the cubical and conical revolving mixers seem to be most satisfactory. The author himself prefers the Smith.

"The forms for concrete should be well made of strong, dressed lumber, well braced. For work requiring a smooth surface we prefer matched or at least sized lumber and believe it is better than trying to spend too much time and waterial in plastering, which may stick to the form, be knocked off by careless workmen, or separated from the body of the concrete from unknown causes. By keeping the larger material back from the form an excellent surface may be obtained. For inside stiffeners wire is probably the best, while the outside will be braced with 4x4 material or heavier according to circumstances.

"A very important consideration in wall work is an interlocking joint for sections and an allowance for contraction and expansion at the end of each section.

"The best way to accomplish this is to insert a V or U shaped timber in the end of each section, practically making a tongue and groove.

Care in Completing Work.

"Care should be taken that the material is placed in even layers; and if possible arrange the work so that each section or set of sections will be completed for a day's work, as in joining on old work it is difficult to make a good union, especially in dry, hot weather. The layers should be watched, particularly in dry weather, to keep them from drying out too fast, and sprinkled if necessary. Continuous work night and day is also recommended on large and important work.

"Shoveling is a poor way to transport concrete; the larger bulk the batch is moved in the better; large barrows, carts, carriers, etc., should be employed and the concrete landed as nearly as possible in position.

"All work should be tamped well to place, and if the laying is interrupted the set surface should be well wet and given a coat of neat cement before fresh material is applied.

"Do not attempt to fill or brush over joints, as they will break out in jagged lines the first winter. A neat joint made by a jointing toll is better. The same principle applies to brush wash. The writer has never seen a neat job of work where it was patched up by brush wash.

"In freezing weather concreting work may be carried on with fair results, but it is more expensive and requires eternal vigilance on the part of the engineer or inspector. The sand should be hot and dry, the aggregate heated, the water worm and about a pail of salt used in each barrel of water, or about the proportion of 1 to 15. If the work is carried on as above and not interrupted it will set properly, but if you stop at night, or for any other reason, and the work freezes there will be a line of separation where the fresh work is added."

ASPHALTUM AND BITUMINOUS ROCK PRODUCTION.

The domestic production of asphaltum and bituminous rock in 1904 shows a decline over the previous year of about 28 per cent. 71,572 short tons valued at $903,741 were produced in 1904 against 101,255 short tons valued at $1,005,446 for 1903.

The term asphaltum is rather loosely used in commerce to designate any or all varieties of hydro carbon compounds, which mineralogists distinguish as asphaltum proper, elaterite, wurtzilite, albertite, grahamite, uintaite, gilsonite, etc. The petroleum of California yields, on destructive distillation, a residue which so closely resembles asphalt that it is called "oil asphaltum."

The term "bituminous rock" covers the asphaltum-bearing sandstones and limestones which are quarried in some states and used alone or mixed with other broken rock in the making of street pavements.

The output of bituminous sandstone decreased from 38,633 short tons ($118,001) in 1903 to 19,641 short tons ($71,465) in 1904. Mastic is given at 961 short tons ($11,532) in 1903, most of which was produced from bituminous sandstone quarried in Kentucky, and increased to 1,290 short tons, valued at $10,800, in 1904. The production of hard and refined or gum asphalt shows an increase in quantity from 12,896 short tons ($343,799) in 1903 to 15,012 short tons ($224,446) in 1904, though there was a decrease in value in 1904 of $119,353. The production of liquid asphaltum, or maltha, was 3,360 short tons, valued at $36,260, reported from California, and 3 short tons, valued at $60, reported from Texas. The production of oil asphaltum decreased from 46,187 short tons ($522,164) in 1903 to 36,030 short tons ($376,135) in 1904, and the average value per ton decreased from $11.31 to $10.44.

During the fiscal year ending June 30, 1904, asphaltum and manufactures of asphaltic material of domestic production to the total value of $160,186 were exported from the United States to other countries. The most important receivers of these products were, in the order named, Dominion of Canada, Germany, United Kingdom, Peru and France. The corresponding exports for the fiscal year ending June 30, 1903, amounted to $104,586.

Nearly two-thirds of the asphaltum which is imported into the United States from foreign countries comes from the Island of Trinidad, off the coast of Venezuela, an asphalt lake in the southwest portion of the island. The asphalt in this lake evidently comes from the same subterranean source as the Pitch Lake in Venezuela. The Venezuelan lake contains a higher percentage of bitumen than the Lake Trinidad asphalt.

The two lakes are exactly alike in appearance. The Trinidad lake proper covers about 100 acres, and it is nearly circular. It is half a mile inland and is connected with the shore by a cable carrying great buckets, from which the asphalt is dumped into the holds of the ships lying at the pier. The surface of the lake is smooth and about as hard as an asphalt pavement in August. The asphalt is dug out in large chunks to a depth of two feet, and the holes are rapidly filled up by the pressure from below. It is estimated that the surface of the lake is lowered a foot a year. Borings indicate that the supply of asphalt is practically inexhaustible.

Other important sources of the material are Venezuela (Bermudez), Cuba, and France. Smaller quantities, mostly in the shape of bituminous limestones, are imported from Nova Scotia, Turkey in Asia, British India, Mexico, Colombia, United Kingdom and Italy.

The imports from Trinidad decreased from 129,133 long tons ($367,003) in the fiscal year ending June 30, 1903, to 110,031 long tons ($368,023) in the fiscal year ending June 30, 1904, while the imports from Venezuela increased from 16,445 long tons in 1903 ($74,874) to 50,194 long tons ($217,017) in 1904. The imports from the British West Indies in 1904 include 649.5 short tons of manjak, valued at $28,578. The imports from Cuba show a decrease from 9,898 long tons ($48,218) in 1903 to 9,494 long tons ($22,230) in 1904. The imports from Italy fell off from 13,789 long tons ($61,284) in 1903 to 3,211 long tons ($11,581) in 1904. The imports from Cuba remain about the same as in 1903, but there is an unexplained drop of more than 50 per cent in valuation. The increase in quantity and value of asphalt received from Venezuela more than made good the decrease in imports from other countries, so that the total importations in 1904 were 175,640 long tons, valued at $643,785, as compared with imports of 172,892 long tons, valued at $585,865, in 1903.

CEMENT DAIRY BARN FLOORS.

By Herbert A. Hopfer.

The Illinois Experimental Station Department of Husbandry, University of Illinois, is sending out the following instructions to farmers on concrete floor constructions for dairy barns:

"Within the past few years the use of cement and concrete in making an impervious floor for dairy cattle has become quite general. In fact, the cement floor is looked upon by dairymen in the more progressive regions as essential. Its first cost is somewhat greater than that of a wooden floor, but when its durability and convenience are considered, it is by far the cheaper. The fact that it is permanent adds greatly to the importance of its introduction and use in all dairy regions where so many cows are kept and the conservation of manure is such a vital problem. In cold weather cattle on cement floors must be well bedded else there may be injury done the udder by coming in contact with the cold cement. The construction of a cement floor is simple, though the uninitiated often experience some difficulty in understanding the fundamental principles. The materials used in the construction of a cement floor are gravel (or, better, crushed rock), sand, cement and water; the cement binding the whole together by forming an artificial stone. In many parts of Illinois gravel cannot be had and crushed rock is too expensive. The use of mine slag in making concrete has been suggested, but unfavorable reports follow its use. The construction of the floor is divided into two parts; the concrete, consisting of about three inches of mixed gravel and cement to form a foundation, and an upper layer of one-half inch called the facing coat made of sand and cement in the ratio of two of good, sharp sand to one of cement. The composition, mixing and laying of each part is given in detail below.

Construction.

The cement floor can be put in as soon as the foundation wall is completed, but its construction is usually deferred until the building is inclosed. At first, six or eight inches of the surface soil should be removed and the surface reduced to an even grade and thoroughly tamped to form a firm foundation on which to place the concrete. When available, flat stones, cobble stones, brick bats or refuse from tile yards can be used with coarse cinders to form a foundation on which to place the concrete. Whatever is done, before laying the concrete the surface on which it rests must be solid and even, for the life of the floor depends upon the success attained in preventing the formation of cracks which result when a floor with a weak foundation is subjected to constant use.

Making the Concrete.

For cement floors in dairy barns, the concrete should be at least three inches thick and the materials mixed in the following proportions:

Gravel or stone........	6 parts.
Sand	2 parts.
Portland cement	1 part.

When crushed rock is not available, a good floor can be made from gravel, sand and cement, in which case a little more cement should be used, especially if the gravel is fine, as in this case more cement is needed to bind the mass firmly together. The right proportion of cement, sand and gravel is placed upon a mixing board and thoroughly worked over dry so that the cement is evenly distributed through the mass. Some unit should be taken for convenience in measuring out the different quantities of cement, sand and gravel and its size should depend upon the amount of work to be done. Either a wheelbarrow, pail or shovel will be found to answer the purpose well. After the gravel, sand and cement have been thoroughly mixed, a sufficient quantity of water should be added to make a stiff paste. When crushed rock is used it should first be thoroughly drenched to wash off all dust adhering to the fragments and then well mixed with the gravel, sand and cement. After the water has been applied the mass must be continuously stirred until placed in position.

Laying the Concrete.

Cement floors give best satisfaction when laid in blocks four or five feet square, building alternate blocks first so that there will be time for setting and thus prevent a strong union of the blocks. When the floor is not laid in this manner, cracks are sure to occur. The concrete should be made only as fast as used and must be tamped with a heavy pounder until the cement and moisture appear on the surface. In order to get a close bond between the particles they must be brought into contact by pounding, the appearance of moisture on the surface indicating that the spaces of the concrete are reasonably well filled. Narrow strips of lumber supported by stakes may be used to form the boundary of the blocks, but should be removed after the concrete begins to harden and before the adjacent block is constructed.

Finishing Coat.

It is important that the finishing coat be made, if possible, of sharp plastering sand and high grade cement. For stable floors the proportion should be two parts of sand to one part of cement. The materials should be carefully mixed while dry, as indicated for the concrete, and enough water added to make a plastic mortar. This should be applied before the concrete has hardened and should be floated down to a thickness of one-half inch. For dairy cows the floor should never be made smooth. After the finishing coat has been floated to the proper thickness, it should be roughened by drawing over it a straight edge which has not been surfaced. This slightly rough surface prevents injury to the cattle by slipping and aids in keeping the bedding in place. This last coat must be cut through on the division lines of the concrete blocks and the edges neatly rounded."

The Harmon S. Palmer Company, of Washington, D. C., has just fitted up three rooms in the basement of their new offices, in which they intend to install a printing press with all necessary equipments. They are already operating a small press with good results.

The new catalogues descriptive of their self-closing adjustable automatic building block machine is well under way, which is the beginning of a new epoch in the history of hollow block construction. The universal publicity and experience of the last two years is now beginning to bear fruit of a wholesome kind, and the great increase in their business is proof that the mind of the general public about the industry is beginning to settle.

Two additional patents have been allowed to this company for improvements in building with hollow blocks.

What promises to be of great interest to many people of Washington is the organization of a proposed company to build cheap and sanitary houses with these blocks, which can be rented to the occupants of a cheap wooden house so prevalent in many parts of the city. This company will erect good substantial two-story buildings of good architecture and fireproof, which will be rented at a profit not to exceed nine per cent on the investment. Money can be had at from four and one-half to five per cent and when invested in this kind of property is well secured, besides giving a fair income. To many persons in this city, as well as most other cities, this will be a welcomed boon, and is worthy of the support of every person who has a bit of philanthropy in his blood. A great deal of Washington property is netting the owners from fifteen to twenty per cent, and the same is likely in other cities, when, by a little concentrated action property owners could and should be more liberal and erect for those who desire to live in better dwellings something nice and cheap at a fair profit on the investment. This is a most vital question and should receive the attention of every public-spirited citizen, and especially those who have the city's health to look after.

Investigations of Structural Materials to Be Made at the Laboratories of the U. S. Geological Survey at St. Louis, Mo.

Cement Mortars and Concretes.

I. EXAMINATION OF CONSTITUENT MATERIALS. Sands, gravels, stone, stone screenings, slags, cinders, etc., to be collected by a special representative of the Testing Laboratory sent out for that purpose.

A. Examination of Deposit

As to the extent and nature of the material from which the samples are collected.

B. Physical Tests in the Laboratory:

1. Mineralogical examination.
2. Specific gravity.
3. Weight per cubic foot.
4. Sifting (granularmetric composition).
5. Percentage of silt and character of same.
6. Percentage of voids.
7. Character of stone as to percentage of absorption, porosity, permeability, compressive strength and behavior under treatment.

C. Chemical Analysis

As to the character of the stone, silt, etc., used in these tests.

II. TESTS OF MORTARS made with a Typical Portland Cement and sand, gravel and stone screenings. The Typical Portland Cement to be prepared by thoroughly mixing a number of brands, each of which must meet the following requirement:

Specific gravity, 3.10.

Fineness, residue not more than 8 per cent on No. 100 and 25 per cent on No. 200 sieve.

Time of Setting: Initial set not less than 30 minutes; hard set not less than 1 hour or more than 10 hours.

Tensile Strength: 24 hours in moist air, 175 pounds; 7 days (1 day in moist air, 6 days in water), 500 pounds; 28 days (1 day in moist air, 27 days in water), 600 pounds.

One Part Cement, 3 Parts Standard Sand: 7 days (1 day in moist air, 6 days in water), 175 pounds; 28 days (1 day in moist air, 27 days in water), 250 pounds.

Constancy of Volume: Pats of neat cement 3 inches in diameter ½ inch thick at center, tapering to a thin edge, shall be kept in moist air for a period of 24 hours:

A. A pat is kept in air at normal temperature and observed at intervals for at least 28 days.

B. Another pat is kept in water maintained as near 70 deg. F. as practicable and observed at intervals for at least 28 days.

C. A third pat is exposed in an atmosphere of steam above boiling water in a loosely closed vessel for five hours.

These pats must remain firm and hard and show no signs of distortion, checking, cracking or disintegration.

The cement shall contain not more than 1.75 per cent anhydrous sulphuric acid or more than 4 per cent magnesium oxide.

A test of the neat cement must be made with each mortar series for comparison of the quality of the Typical Portland cement.

A. Physical Tests in Laboratory:

1. Tensile strength with one part cement to varying percentages of material under test for 7, 28, 90, 180 and 360 days.
2. Compressive strength with one part cement to varying percentages of material under test for 7, 28, 90, 180 and 360 days.
3. Transverse strength with one part cement to varying percentages of material under test for 7, 28, 90, 180 and 360 days.
4. Yield in mortar.
5. Tensile strength with cement, material sieved to one size, 7, 28, 90, 180 and 360 days.
6. Compressive strength with cement, material sieved to one size, 7, 28, 90, 180 and 360 days.
7. Transverse strength with cement, material sieved to one size, 7, 28, 90, 180 and 360 days.
8. Porosity.
9. Permeability.

III. TESTS OF CONCRETE made with stone, stone screenings, gravel, sand, cinder, slags, etc.:

A. Physical Tests in Laboratory

1. Tensile strength with different mixtures as to proportion and size of the aggregates, for 30, 90, 180 and 360 days.
2. Comprehensive strength with different mixtures as to proportion and size of the aggregates for 30, 90, 180 and 360 days.
3. Transverse strength with different mixtures as to proportion and size of aggregates for 30, 90, 180 and 360 days.
4. Absorption.
5. Weight per cubic foot.
6. Modulus of elasticity in compression and tension.
7. Character crushed material used.
    (a) Weight per cubic foot.
    (b) Size.
    (c) Percentage of voids.
    (d) Percentage of silt.
8. Porosity.
9. Permeability.
10. Fire resisting qualities.
    (a) Effect on hardening concrete.
    (b) Effect on hardened concrete.
11. Freezing tests.
12. Yield of concrete.
13. Effect of vibration.
    (a) On hardening of plain and reinforced concrete.
    (b) On hardened plain and reinforced concrete.
14. Protective influence against corrosion of metal.
15. Adhesion of concrete to metal for varying periods, under varying conditions, up to at least 3 years.
    (a) Embedded.
    (b) On flat surfaces.

B. Full Size Tests.

1. Beams of various spans, sections and compositions.
2. Building blocks and bricks as to:
    (a) Compressive strength, wet and dry mixtures.
    (b) Transverse strength, wet dry mixtures.
    (c) Shearing strength, wet and dry mixtures.
    (d) Absorption, wet and dry mixtures.
    (e) Permeability.
    (f) Methods of waterproofing.
    (g) Fire resisting qualities.
    (h) Efflorescence.

IV. TESTS OF REINFORCED CONCRETE: BEAMS.

A. Physical Tests in Laboratory:

1. Varying percentages of round, square and flat bars in bottom.
2. Varying percentages round, square and flat bars in bottom and top.

Approved by the Advisory Board June 3, 1905.

Charles B. Dudley,
President.
Richard L. Humphrey,
Secretary.

REINFORCED CONCRETE.

The plans for New Lackawanna terminal on the Hoboken water front destroyed by fire in August will be rebuilt in reinforced concrete construction and will be fireproof.

It is about time that somebody discovered the necessity for a change in construction on the waterfront in and about New York, and what is true of New York is true of all our seaports. None of the municipalities would permit the building of such flimsy, firetrap buildings in any other part of the city, yet down on the waterfront it seems to have been a rule that "any old thing goes." The city of New York permits the building of a railway's ferry-terminal or of a dock-shed on the pier of a stemship line that is nothing better than fuel for flames. But if the New York Central or Pennsylvania roads had proposed to erect such flimsy structures for their new stations at Forty-second street and Thirty-third street the fire department and the building department, and perhaps half a dozen other departments, would have been in the field with protests. Why not be a little consistent in these things.

The Star Sidewalk and Brick Co. of Anoka, Minn., has been organized to manufacture cement building blocks.

BRICKLAYERS BAN CONCRETE.

Believing the increased use of concrete as a substitute for brick and stone in buildings means the loss of employment to many thousands of bricklayers, the New York State conference of the bricklayers' unions will hold a special meeting in New York City in September, to decide upon measures to prevent such an increase.

President Bowen of the Journeymen Bricklayers and Masons' International Union has issued a statement in which, after saying the bricklaying trade is prosperous now, he continues:

"The only thing that is giving the union serious concern now is the use of concrete in buildings. Unless this is stopped the existence of our trade is menaced seriously. Concrete buildings have become a sort of fad, and unless the style is killed the bricklayers' and masons' unions must die. Time will show that concrete buildings are far less durable than those constructed of brick or stone. Meantime, members of our craft will die from starvation unless people continue to have buildings made of the latter materials."

The Cement Block and Concrete Workers' Association of Oklahoma and Indian Territory was organized at El Reno, Okla. Oklahoma City was chosen for permanent headquarters of the association with W. I. Wasson, late of Pond Creek, in charge. Mr. S. Myers of Shawnee, Okla., says: "The purpose of our organization is to wrest control of the cement business of the two territories from the lumber trusts. The lumber dealers are not entitled to hold it as it is a very small factor of the building business, yet they have been holding the cement trade as in a vise and controlling the prices. The cement contractors have tired of this situation and have determined by organization to revolutionize conditions in this respect. The leading users of the commodity in the two territories have joined our organization and as we use the cement and pay for it, there will be little difficulty in winning the fight that has been precipitated. Some of the leading cement concerns in the country have given us the assurance of financial support in this undertaking and we expect very shortly to erect and operate a big cement warehouse in Oklahoma City. Our contention is just, as the lumber dealers have no right to control the cement business, and that we will win a victory is practically assured."

The American Cement Co. is erecting a stock house at Egypt, Pa. It will be 150 by 800 feet. Construction of wood and concrete with a sheet-iron roof.

The fire department, ambulances and surgeons hurried to the scene. The work of rescuing the injured men from their perilous positions and the fighting of the fire were carried on at the same time. The department soon had the blaze in and about the crusher extinguished with but a slight loss of property. A previous explosion on August 17th, at the same place badly burned two men and resulted in a fire loss of several hundred dollars.

There is much activity in the La Salle, Ill., cement district. The Chicago A. A. and the Marquette Portland Cement plants are contemplating enlargements and the German-American Portland Cement Co. has already taken steps towards enlarging from 1,000 to 2,000 barrels daily capacity. Mr. M. M. Green, consulting engineer of Detroit, is drawing plans for the latter company's new power plant.

Portland Cement is selling at $4.00 per barrel in 500 barrel lots in San Francisco. This is nearly double the usual price. The Cement and Engineering News has received several letters from California parties who desire eastern mill connections. The local mills are working overtime to keep up with the demand, yet they are far behind on orders.

The land and building of the Egyptian Portland Cement Company, located near Fenton, were disposed of today at a sheriff's sale, to John Meyers, whose bid was $140. Meyers secured a judgment against the company July 6th, last, the case coming up in the Wayne county circuit court. The amount of the judgement was $430.

An explosion in the coal grinding department on Sept. 5th, at the German American Cement works resulted in the severe injury of four men and a fire, which for a short time threatened to do considerable damage.

The Ruggles-Coles Engineering Co. have prepared plans for a slag cement plant at Buffalo, N. Y., to be known as the Niagara Cement Co. W. B. Ruggles, president, 39 Cortlandt St., New York City.

The Heldeberg Cement Co. will improve and enlarge its plant at Howes Cave, N. Y. $100,000 will be spent on the work. Julius W. Pfau has been returned as consulting engineer.

Incorporated, The Western Canada Cement & Coal Co., Ottawa. Capital, $1,250,000. A. F. MacLaren, W. A. Fleming, C. A. Irvin, J. Lavelle and S. F. Bell, Ottawa, Canada.

The University of Wisconsin, Madison, Wis., has issued Bulletin No. 121, giving the five years' course in chemical engineering and gas engineering recently adopted by the Engineering College. The purpose of the course is to thoroughly train students in the fundamental principles of both chemistry and engineering.

The Portland Cement Co. of Portland, Colo. will increase its capacity. Concrete foundations are in for the extension of its buildings. A 1,000 h. p. engine has been ordered. Twelve concrete houses for employees will be erected by the company.

C. L. Millhouse and D. McHenry of the McHenry-Millhouse Manufacturing Company of South Bend, have purchased the plant of an automobile company at Buchanan, Mich. It will be converted into a cement brick factory.

The James Clark Distillery Co. will erect a large concrete warehouse to store 10,000 barrels of whiskey and spirits. It will be the largest warehouse of its kind in the United States. The walls will be eighteen inches thick.

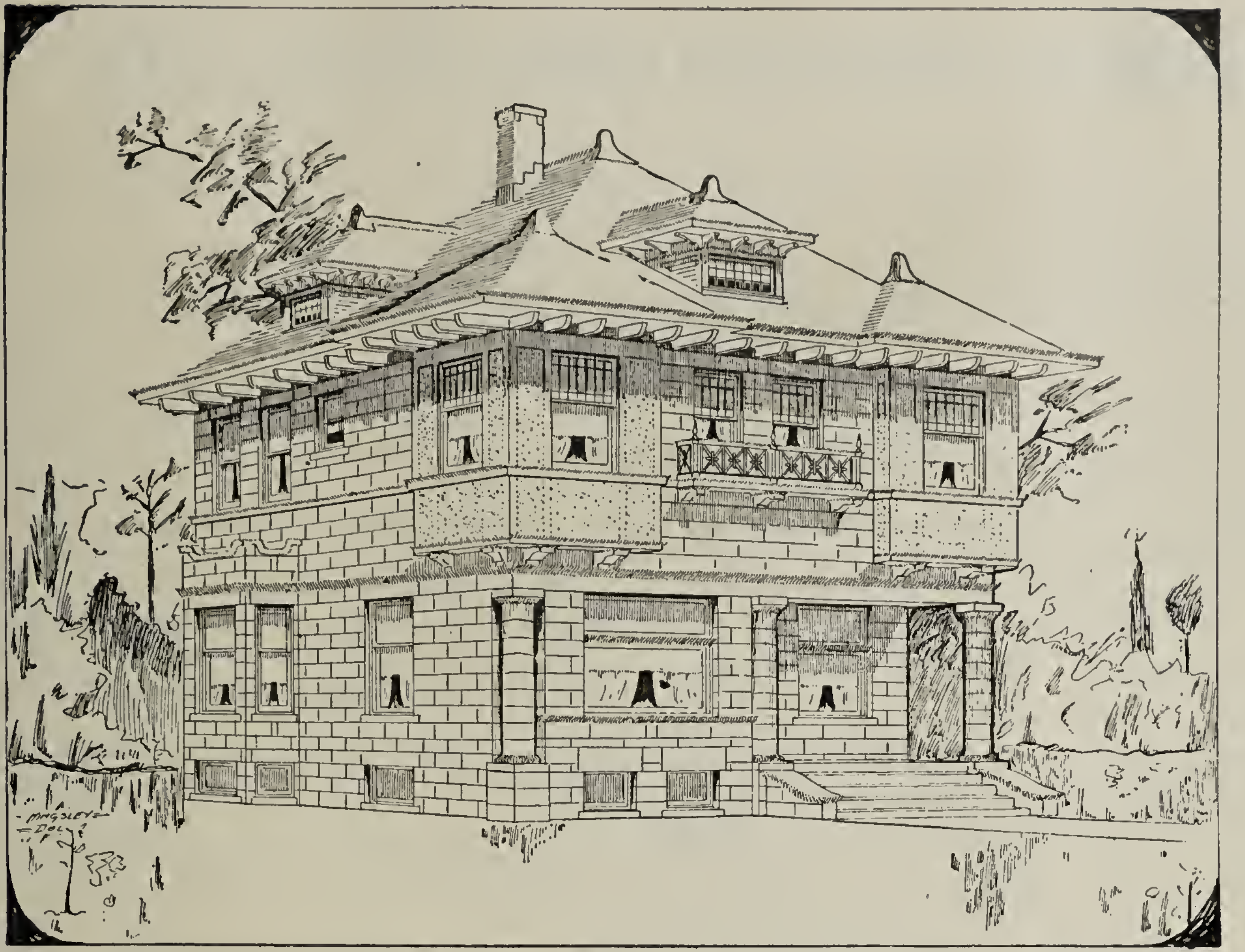
The Trenton, Mo., mission church is being constructed of concrete building bricks; 1,400 blocks will be used. The Trenton Lumber Co. are the contractors for the structure.

BOOK NOTICES.

STEEL AND IRON HARDENING MATERIAL.

The United States Geological Survey Department of the Interior, Washington, D. C., has issued a sixty-two page pamphlet covering the production and use of nickel and cobalt, chronium, tungsten, nolybendum, vandium, titanium, and uranium, all of which are used in the hardening of steel and iron. The improved methods of preparing these metals for the market are described and includes the Goldschmidt or Alumino-thermit process, the Rossi Method and the Green and Wall Method. The quantities and sources of supply of these metals are given in detail. Every page contains valuable data on the subject under consideration.

The Sandusky Portland Cement Co. of Sandusky, O., has issued and is circulating a pamphlet covering the use of Medusa waterproofing compound to render cement work waterproof, especially for cement building blocks, roofing tile, conduits, cisterns, tanks, silos, etc. Numerous letters from users of Medusa water proofing are given showing the high appreciation of its merits in actual construction.



Concrete Block Dwelling House, Designed by W. M. Kingsley, Architect, Rockerfeller, Bldg., Cleveland, Ohio.

Harbison-Walker Refractories Co.
PITTSBURG, PA.

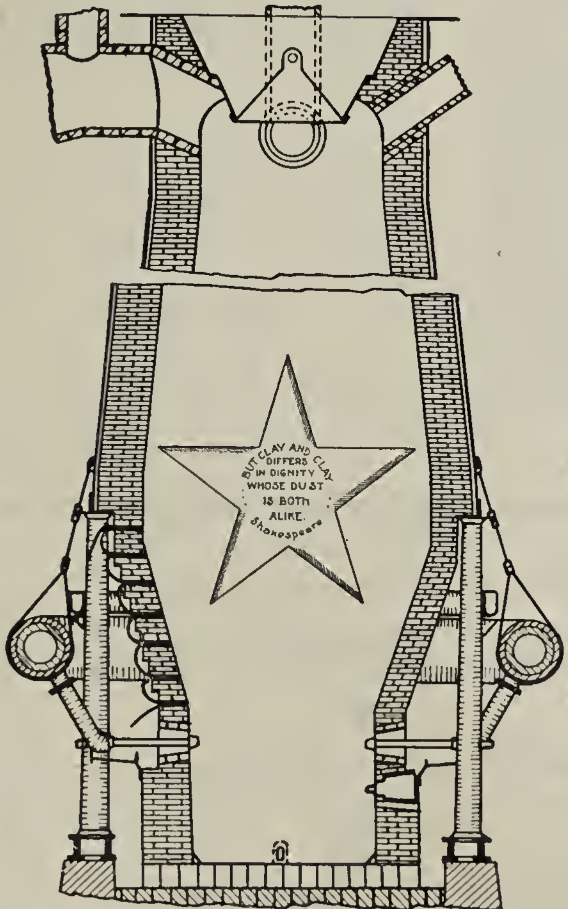
High Aluminous Blocks for Discharge End of Rotaries.

Best Brick for Nose Tail and Feed End.

Brick for Driers—Hoods—Stacks—Boiler Settings.

Special Shapes for Deitsch, Aalborg and Bottle Kilns—Vertical Kilns, etc.

Send for Catalogue "C."


BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE.
Shakespeare

1,100,000 Daily Capacity
7,000 Regular Customers

No Order too Small for Our Best Attention; None too Large for Our Capacity.

Our Records Prove:
Highest Quality.
Uniformity.
Superior Results.

We Have Expert Knowledge for Your Brick Troubles.

Always State for What Purpose Brick are to be used.

Mfrs. Highest Grade Refractories.

FIRE CLAY BRICK
STAR SILICA BRICK
DEAD BURNED MAGNESITE
MAGNESITE BRICK
CHROME ORE
CHROME BRICK

DENSITOR For Waterproofing Concrete **FILLS THE VOIDS**

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor as a filler for portland Cement paint will cover from 15 to 20 sq. ft. of surface, depending upon the density or porosity of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,
228 La Salle St., CHICAGO, ILL.

5 Pound Samples F. O. B. Chicago, $1.00. This can be mixed with 60 pounds sand and gravel and 10 pounds cement for Densitor Concrete. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED
GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.
We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
Washington, D. C.

BACK NUMBERS WANTED

1896
July November
December

1897
January May
February June
March July
April September

1898 .... June

1899
January July
February October
March

1902
August September

1904
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CEMENT AND ENGINEERING NEWS
162 La Salle Street, CHICAGO, ILL.

Fire Brick Linings
For Cement Kilns

STANDARD TESTING SAND AND GENERAL BUILDING SUPPLIES

Garden City Sand Co.,
188 Madison St., Chicago

WANTED AND FOR SALE ADS.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

FOR SALE—A Roofing-tile and Building-block Plant, consisting of 2 American Cement Roofing-tile Machines, 2 Building-block Machines, 1 Brick Machine, a good stone building and one acre of ground. Good location and well established trade. Will make a low figure to quick buyer. Address J. A. DANNENBERG, Paulding, Ohio.

WANTED — First-class superintendent for modern 500-barrel capacity slag mill. Address, with references, "Canada," care CEMENT & ENGINEERING NEWS.

WANTED—A chemist, experienced in the manufacture of Portland Cement from marl, by wet process. Apply, giving in detail age, experience, references, salary wanted, and whether married or single, to Box B. C., care of CEMENT & ENGINEERING NEWS.

SITUATION WANTED—As assistant superintendent and mechanical engineer in cement mill. Seven years practical experience. Wet and dry process. Can introduce new designs and improvements. First-class references. Address G. E. F., care Cement & Engineering News.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

POSITION WANTED.

A thoroughly practical cement chemist is open for engagement. Technical training and mill experience. Address Box A. O., CEMENT AND ENGINEERING NEWS.

POSITION WANTED—Technical cement chemist and engineer of the broadest experience in cement manufacture, desires position. Address "Experience," care of CEMENT & ENGINEERING NEWS.

Santa Cruz, Cal., paper states that a Portland cement plant is to be erected at San Vincente Creek. A railway is to be built from the plant on the coast, up the San Vincente canyon seven miles to the lime rock deposits.

CEMENT CHEMIST

Five years' experience on both wet and dry process with marl, limestone, clay and shale, desires position. Address "W. L.," care of CEMENT AND ENGINEERING NEWS.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

The White Publishing Co. of Grand Rapids, Mich., will erect a fireproof factory building, 50x170 feet, three stories high, to cost $30,000. The floors and roof will be reinforced concrete.

"Portland Cement Sidewalk Construction"

Based upon the experience of many successful contractors.

Compiled by
P. B. BEERY.

PRICE 50 CENTS

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Assistant Engineer Eng. Dept. U. S. Army, Member American Society Civil Engineers

An up-to-date thoroughly practical treatise on the use of concrete, covering all branches of construction

Price, $5.00

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Ball Mill
Tube Mill
Steel Balls

For
CEMENT WORKS
For Grinding
RAW MATERIALS,
CLINKER AND COAL

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GRIFFIN —MILLS—
REPAIR PARTS

GIBS, TRUNNIONS —AND— PRESSURE RINGS

RIGID INSPECTION BEST MATERIALS
NAZARETH FOUNDRY & MACHINE CO.
Gen'l Founders and Machinists, Nazareth, Pa.
Repair Parts. Write us.

LIME ROCK SLATE SHALE

ARE THE RAW INGREDIENTS WHICH MIXED IN THE PROPER PROPORTIONS MAKE THE

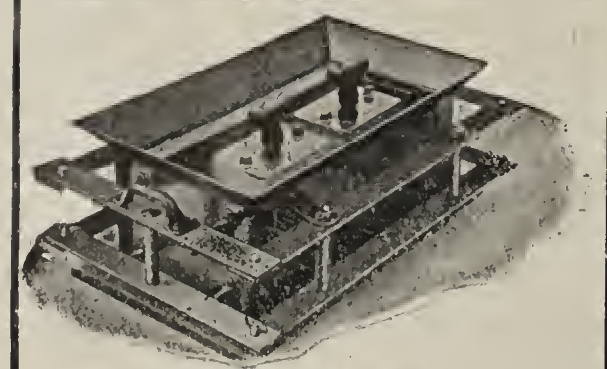
HIGHEST GRADE
PORTLAND CEMENT

We have 400 acres containing an inexhaustible quantity of these materials; located on two trunk lines; low freight rates; steady demand for the product; unusual facilities for exporting; an abundant water supply, combine to make this the most attractive proposition ever offered for the location of a

PORTLAND
CEMENT FACTORY

For further information address the undersigned, who will gladly submit samples of the materials together with an analysis.

J. W. WHITE,
General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.



THE BEST, FASTEST,
CHEAPEST AND SIMPLEST.
HOLLOW CONCRETE BUILDING
BLOCK MACHINE
1 MAN CAN MAKE 200 BLOCKS PER DAY
NO CARRYING OFF BLOCKS. NO IRON PALLETS. NO COGS OR SPRINGS.
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CEMENT DEPARTMENT.
Inspections, Reports and Tests of Cement Materials.
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Cement Plants Designed, Constructed and Operated.

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CONSULTING ENGINEER
816 Phœnix Building, MINNEAPOLIS, MINN.
Bridges, Buildings,
Concrete-Steel Construction.

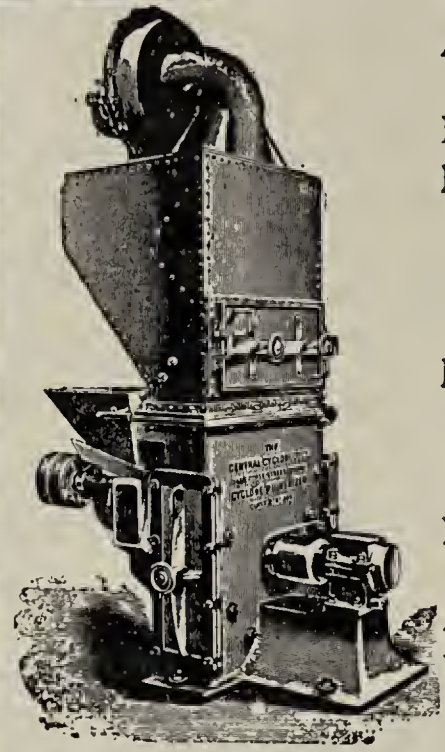
Abundance of High Grade Materials!
Low Cost of Fuel!
PROXIMITY TO BEST MARKETS!

Are all essentials to bear in mind in determining on the location of Portland Cement Works. These essentials can all be had at several points on the line of the Atchison, Topeka & Santa Fe Railway System.

For further information address:

WESLEY MERRITT
INDUSTRIAL COMMISSIONER
Atchison, Topeka & Santa Fe Ry. System

STRAKER'S PATENTED
"Cyclone"
Coal Pulverizer



AIR SEPARATION—No sieves to clog. Mill and product always cool.
DUSTLESS in operation.
PRODUCT is so uniformly fine that ALL or 98%, or 90%, or any other percentage (according as the machine is "set") will, if tested, pass through a sieve of the mesh required.
NO DRYING OF THE COAL is required before grinding unless it contains more than 15% of moisture. The AIR used absorbs and carries off moisture.
RECEIVES COAL in pieces of large size and reduces it quickly to powder.
ANY MESH of powder desired.
USED BY some of the largest Portland Cement Works in the World.

A Larger Output Per H. P. Than Any Other Machinery in the Market.

E. H. STROUD & CO.
MANUFACTURERS for UNITED STATES, CANADA and MEXICO
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On the High Wave of Popularity
The Ideal Hollow
Concrete Block Machine

Not a new machine. Tried and tested over two years. Satisfied users everywhere. Interchangeable to various widths. Adjustable to sixteen lengths. No wheels, cogs, gears, chains or cranks.

Nothing to Clog, Break,
or get out of Simplicity, Rapidity, Adaptability, Durability. Face formed in bottom of mold. Cores withdrawn horizontally by lever. Guaranteed Capacity—Two men, 10 hours, 200 blocks. Portable—Can be carried by two men. Over 200 in use in the State of Indiana alone. The only machine by which can be accomplished the facing of blocks by the Borst System. A business proposition to the maker of blocks. An appeal to the common sense judgment of the builder. In corresponding with us we make our business your interests.

Ideal Concrete Machinery Co.,
South Bend, Ind.

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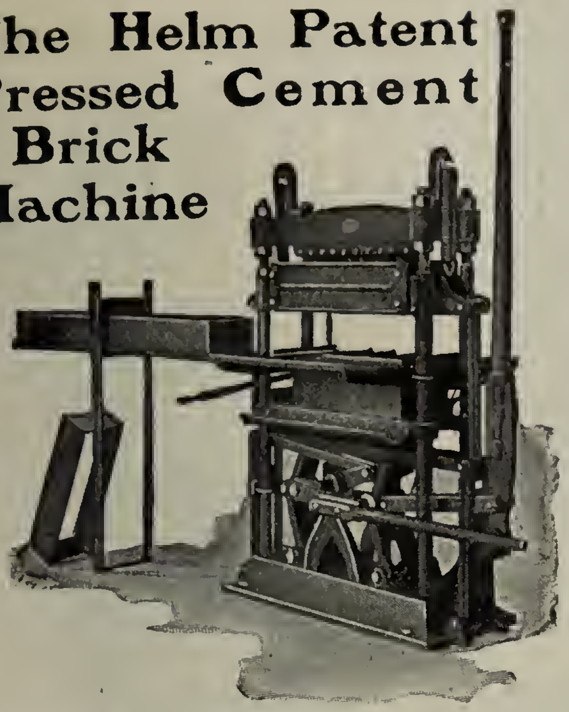
The Helm Patent Pressed Cement Brick Machine



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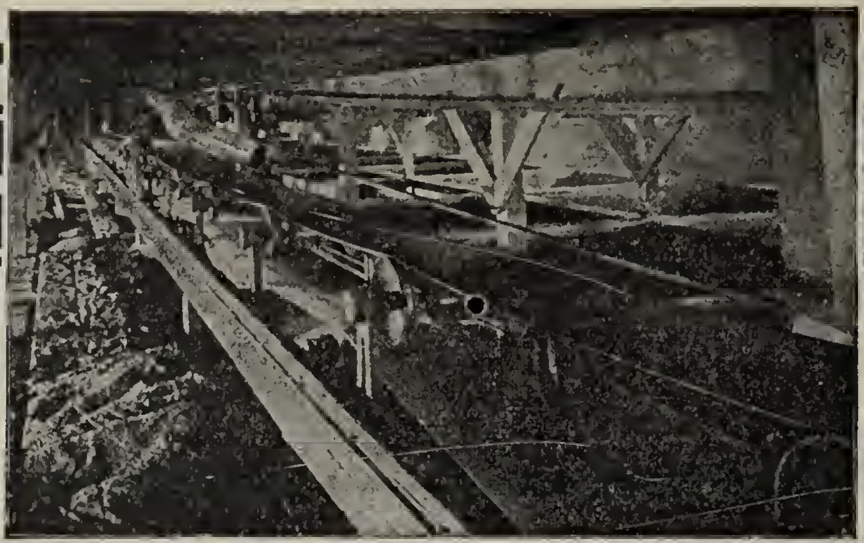

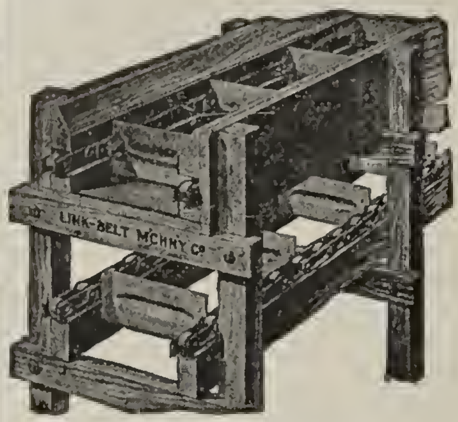

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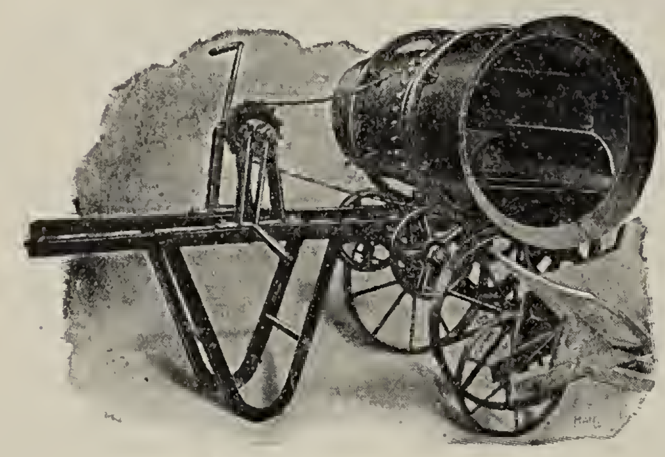

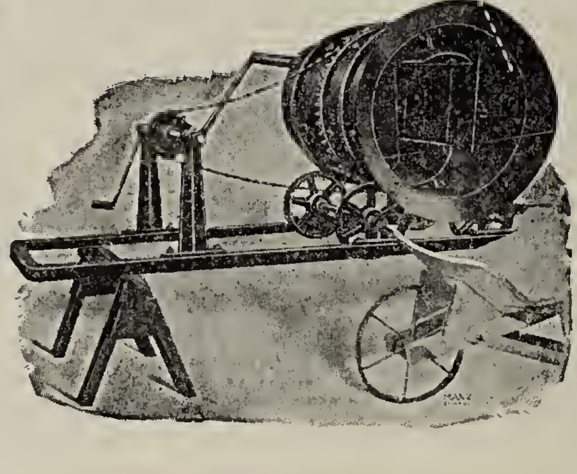

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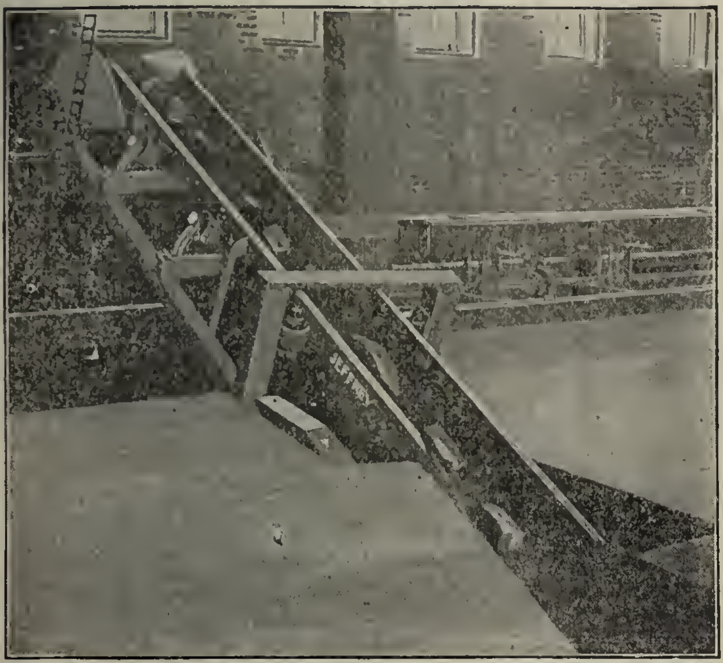

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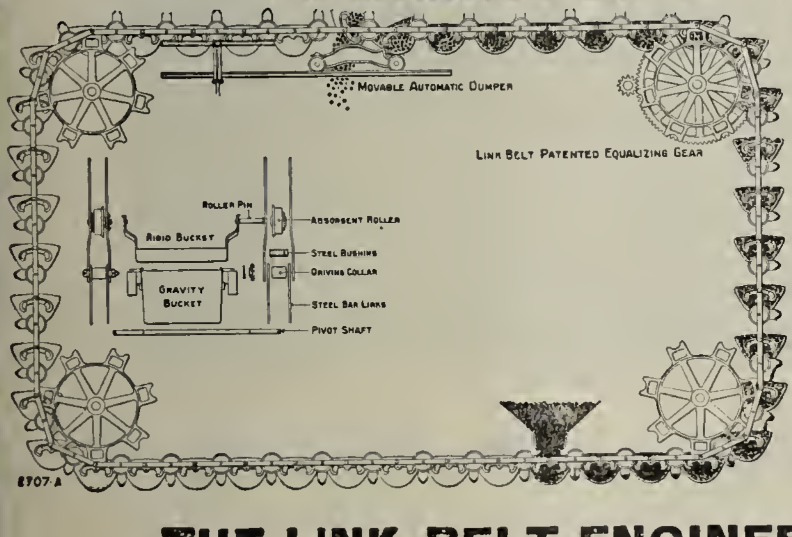

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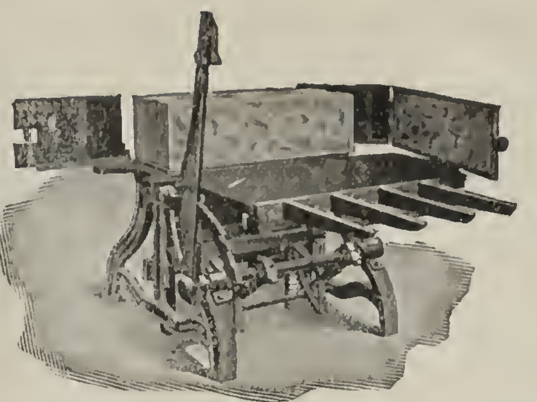

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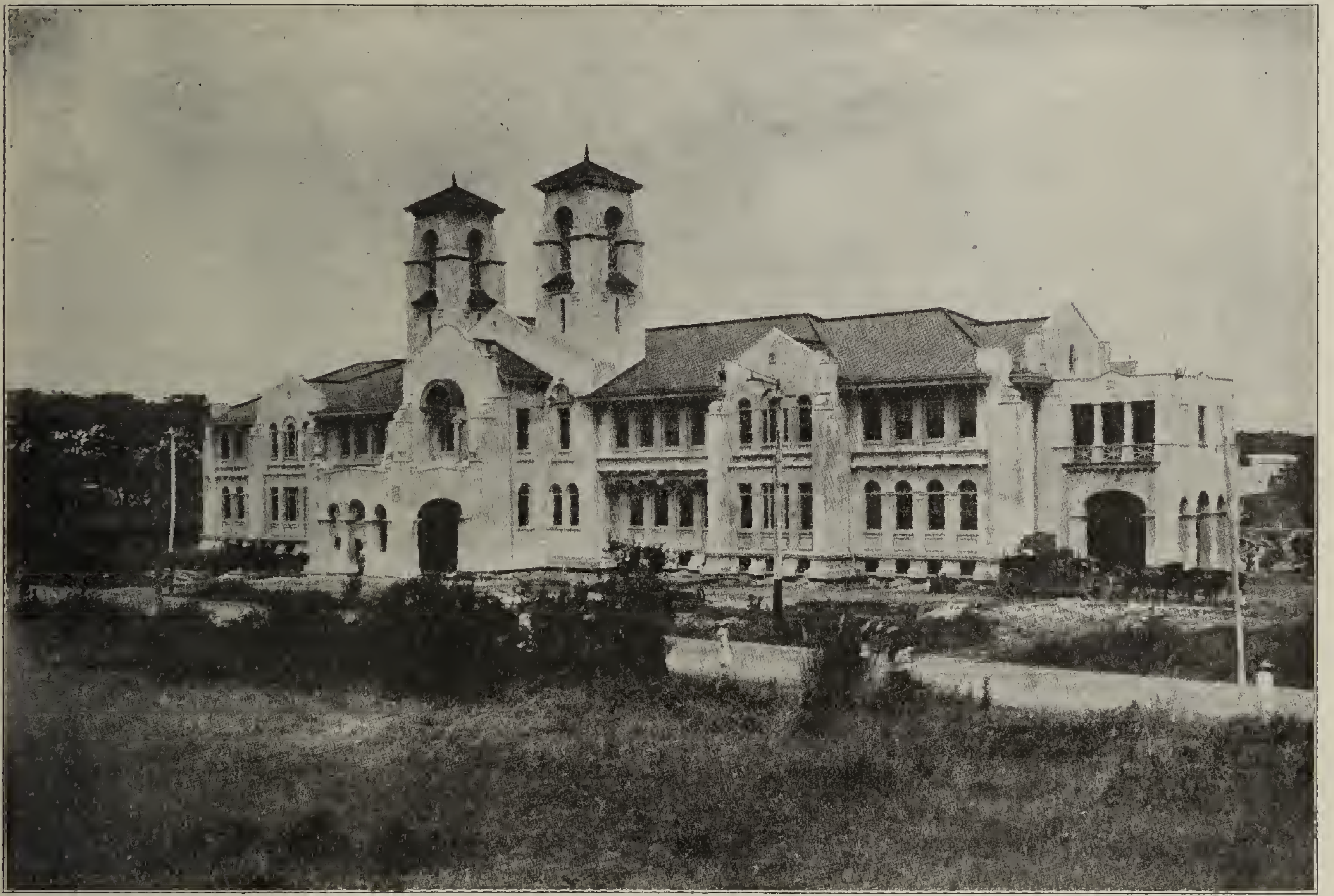

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CHICAGO, OCTOBER, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

STEAM CURING CONCRETE BLOCKS.

The curing of concrete building blocks under steam pressure, direct from the mould is one of the possibilities of the future. Experiments made in sand lime brick steam chambers have demonstrated the fact that such a process is perfectly feasible. The cost of steaming the blocks is the only objection to its adoption, since it calls for expensive installation of steam boilers, large steam chamber in which the blocks are treated under pressure, buildings for housing the plant, cars and trackage and fuel to generate steam. Concrete blocks can be completely cured in from three to four hours. Unsound cement will not stand the steam pressure treatment; therefore, this treatment not only cures the blocks, but submits them to a severe test for soundness. The blocks that come out of the steam chamber sound, will prove durable in the structures in which they are used. One hundred and twenty-five pounds steam pressure maintained for from three to four hours renders the blocks as hard as sixty days curing in air. They can be laid in the walls as soon as removed from the steaming process. This process removes the artificial appearance common to all tamped concrete products and produces a uniform shade or color which is an advantage. The curing of concrete under steam pressure is the same as that employed in the manufacture of lime and sank brick, excepting only the time required, which in the lime sand brick process is about twelve hours under a steam pressure of one hundred and twenty-five pounds while the concrete block requires only from three to four hours treatment. In the sand lime brick process, from 4 to 6 per cent of lime is mixed with from 94 to 96 per cent sand which is formed into brick by powerful dry press brick machines. The high temperature and the steam vapor causes the individual grains of sand to become slightly soluble in the presence of lime. The microscope shows that the sand becomes pitted or roughened under the steaming process, caused by the lime uniting with the surface of the sand; while in the concrete, the cement and lime are ground together and burned in a kiln to incipient fusion which renders the cement more soluble when treated under steam pressure; therefore, less time is required for the concrete to set and harden.

The steam treated concrete does not become less fire proof than the air treated block, on the contrary, it will, become more fire resisting on account of the complete hydration of the cement mixed into the concrete. The water used in mixing the concrete unites with the cement as water of crystallization. Professor Charles L. Morton in his report No. 13, entitled "The Conflagration in Baltimore," published by the Insurance Experimental Station at Boston, January, 1904, explains the fire resisting properties of concrete as follows:

"When brick and terra cotta are heated, no chemical action occurs, but when concrete is heated up to about 1,000 degrees Fahrenheit, its surface becomes decomposed, dehydration occurs and water (of crystallization) is driven off. This process takes a relative great amount of heat. It would take about as much heat to drive the water out of this quarter-inch of concrete partition, as it would to raise that quarter-inch to 1,000 degrees Fahrenheit. Now a second action begins. After the dehydration, the concrete is much improved as a non-conductor, and yet, through this layer of non-conduction material, must pass all the heat to dehydrate and raise the temperature of the layer below, a process which cannot proceed with great speed."

This simply means that while the outer layer of concrete becomes incandescent and consequently porous, while the next layer behind the incandescent surface is giving up its water of crystallization which produces a cooling action, due to the water evaporating out of the concrete. Ordinary concrete possesses the same properties and undergoes the same chemical action of dehydration.

CONCRETE DECKS FOR STEEL SHIPS.

The U. S. Steel Corporation has four new steel steamers, each 569 feet long, 56 feet beam by 31 feet depth. These ships are the largest that ply on fresh water and are used as ore carriers. These four steamers will carry 800,000 tons of ore in a single season.

The "Corey," one of the four sister ships, is fitted up with passenger accommodations. The decks, which heretofore have been constructed of oak, in the case of the "Corey" Portland cement decks have been laid. This makes the vessel practically fire proof. The cement floor or deck is in a measure an experiment. Should it prove durable, cement deck paving will be substituted for wooden decks on all large steamers in the future. All of our war ships are now lined with a cement mortar in the water ballast compartments, where it does excellent service in preserving the metal, which would otherwise rust from direct contact of the salt sea water with the steel plates forming the ship's bottom.

The Sublime Hygienic Cement Flooring Company, Toronto, have been incorporated with a capital of $50,000, to manufacture hygienic cement tiles and blocks and marble mosaic. The provisional directors include L. P. Scarrone, L. V. McBrady and Joseph Murphy, Toronto, Ont.

The total foreign trade for Canada for the year ending June, 1905, was $470,151,289. The imports from the United States amounted to $166,040,890, exports to the United States, $85,563,015. Imports from Great Britain amounted to $60,588,511, exports to Great Britain, $101,968,771. The exports and imports to and from the United States are increasing, while the trade with the British Empire is decreasing.

Burlap bags are being substituted for the ordinary cotton cement bag on account of the rise in cotton cloth.

PORTLAND CEMENT PLANTS IN MICHIGAN IN 1904.

AETNA PORTLAND CEMENT CO.

This plant was organized in 1902 and is situated at Fenton, Genesee County, Michigan. Through the efforts of the manager, John A. Meyers of Detroit, the company has steadily increased its product so that during the year 1904, have manufactured 50,000 barrels more than during the year 1903. This output will still increase next year, for they are now installing a new and extensive marl system, including tow boats, scows, centrifugal pumps, etc., which will enable them to handle the marl, used as a basis, more rapidly and at a less expense. They have just completed an additional stock house, which now provides them with 100,000 barrels storage capacity.

This company has an unlimited amount of material and has been running full capacity all season, having 125 men on their pay roll. Sixty-five per cent of their entire product is sold in Michigan.

ALPENA PORTLAND CEMENT CO.

This is one of three large companies manufacturing Portland cement using lime stone as their basis. This company is situated at Alpena, Alpena County, Michigan. They have good shipping facilities, being situated upon the harbor of one of our great lakes, besides the railroad. They have manufactured 30,000 barrels of cement more during the past year than any previous year. Using limestone as a basis, with 25 per cent clay, they are able to make a first-class Portland cement, which is constantly growing in demand. They have an unlimited amount of limestone and clay, thus making a permanent industry, employing on an average of 135 men during the season, which means $75,000 annually in wages. Fifty per cent of all cement made by the company is sold in Michigan.

BRONSON KALAMAZOO PORTLAND CEMENT CO.

This company, which has reorganized during the past year, and acquiring more valuable property, is situated 2½ miles east of Bronson, Branch County, on the Lake Shore Railroad, and was one of the first plants in the state to start to manufacture Portland cement.

They use marl as their basis, which they have in large quantities immediately adjoining their plant. The clay they use in the cement is obtained in Ohio. The company, since the reorganization, has been making some very extensive improvements in their original plant. So far they have been able to make only about 52 per cent of the capacity of their plant. One-third of the entire product of this plant is sold in Michigan.

EGYPTIAN PORTLAND CEMENT CO.

During the year 1903, Portland cement was made in Fenton, Michigan, by the Egyptian Portland Cement Co. This is another important industry of Genesee County, of which she can point to with pride. During the year the company has employed on an average of 85 men, this being the second year they have been in operation. Marl is used as a basis, using about 20 per cent clay. The company has increased their annual output to a great extent over that of their first year and yet they expect to install additional machinery later. About 70 per cent of the entire product of this plant is sold in Michigan. The company has marl holdings sufficient to continue in operation for one hundred and fifty years. J. F. Williams, of Detroit, Michigan, is General Manager.

ELK CEMENT AND LIME CO.

Was organized in 1903 and is the successor of the Elk Rapids Portland Cement Company. This company is located at Elk Rapids, Antrim County, and was originally constructed for the manufacture of Portland cement from marl. After two years' trial the company has reorganized under the name of Elk Cement and Lime Company, and is reconstructing the entire plant, under the supervision of Homer Sly, Vice President, for the dry process, using limestone as a basis, which they obtain in Ohio. The plant has only run for a limited period during the past year, owing to the reconstruction. Practically all cement made by the former process was sold in Michigan. The company expect to start in the spring of 1905 with a capacity of 1,000 barrels per day. The plant is so located that they will be able to ship their product to all parts of the country by both rail and water.

THE FARWELL PORTLAND CEMENT CO.

This plant situated at Farwell, Clare County, has not as yet been completed. The buildings are complete and the machinery about all installed and they expect to be in operation in the near future. The company has marl beds which will furnish them a supply for 100 years, and when plant is completed, will have a capacity of 600 barrels per day.

GREAT NORTHERN PORTLAND CEMENT CO.

This company was organized in Detroit in 1902, and is located at Marlborough, Lake County, Michigan. Their first cement was made in July, 1903, running only the last part of the year, making 50,000 barrels of cement. During the past year they have made about 225,000 barrels of cement, employing 175 men. This is one of the largest and best equipped plants in the State.

They use marl as a basis and only six per cent of clay. It is claimed upon good authority that the clay used is equal to any that can be found in the United States. Their clay beds are located close to the marl and they have an unlimited amount of both, to last a lifetime. This company has just completed extra warehouses for their finished product, and expect to run 12 months in the year. They are increasing their capacity to 2,500 barrels per day, and shall only stop machinery long enough to make the necessary repairs.

NEWAYGO PORTLAND CEMENT CO.

This plant is located on the Pere Marquette Railroad at Newaygo, Newaygo County, Michigan. This plant was organized in 1899, and is under the management of D. McCool. This is one of the best slurry plants in Michigan to-day, yet the management are considering a change from marl to limestone as a basis. The plant at the present time has a capacity of 1,300 barrels but after the change expect to be able to turn out daily 1,600 barrels of cement.

This company has been able to diminish the cost of the manufacture of cement and has increased its output over 1903, 75,000 barrels; 35 per cent of their entire product was sold in Michigan and still they were unable to supply the demand. While slurry plants do not run to exceed nine months in a year, yet they employ a large number of men and pay good wages. This company has had in its employ during the past nine months an average of 135 men, with an average monthly pay roll of $8,000. With a supply of raw material in sight for the next 25 years, Newaygo can point with pride to an industry of this kind.

THE OMEGA PORTLAND CEMENT CO.

This plant under the management of Chas. F. Wade is located eight miles north of Jonesville, Hillsdale County, immediately adjoining the tracks of the Lake Shore Railroad. This plant commenced operations during the year of 1900, and has a capacity of 600 barrels per day. They use marl as a basis, their marl beds being located within 30 rods of the plant. This marl is taken from the bed of the lake by means of a large dredge dipper which empties into two dump carts that are placed on a towscow immediately adjoining the dredge. When filled they are hauled by means of horses to the bank of the lake where the entire bucket of marl (which contains about one and one-half yards) is taken by means of a traveling pulley and hoisted to its proper height and drawn back over the receiving vat in the mill. This is a very rapid and yet a cheap way of handling the raw material. The company has increased its output for the year 1904 by 10,000 barrels over that of 1903, and sold 40 per cent of their entire product in Michigan. They have in their employ an average of 70 men with a monthly pay roll of $4,500.

PENINSULA PORTLAND CEMENT CO.

This plant was organized by W. F. Cowham of Jackson, Michigan, in 1899, and is located 13 miles south of Jackson at the junction of the Cincinnati Northern & Lake Shore Railroad. It is the parent mill of a series of five cement plants distributed throughout the country known as the Cowham system. This plant is complete in every respect for the handling of the marl and clay, which is done by electrical machinery, specially built for this plant. This company was the first to adopt the use of electrical machinery in handling the raw material, conveying it to the factory and through the entire process of manufacture and converting it into Portland cement without the agency of human hands. During the early part of last summer the company was very unfortunate, losing the entire portion of their plant that was constructed of wood by fire. This was an immense loss in money, to say nothing about the loss of time. They have rebuilt the entire plant that was destroyed and have been able to make 150,000 barrels after being idle three months during the summer. They have on an average of 100 men with a monthly pay roll of $6,000.

THE PEERLESS PORTLAND CEMENT CO.

This plant was one of the first to turn out Portland cement in Michigan, using at that time the old style kilns. These were used up until 1902, when nine rotary kilns were installed. These rotaries have an average of 200 barrels per day to each rotary. This is one of the best Portland cement plants in the state, and has increased its product from year to year. During the year of 1904 they made 105,000 barrels more than during the year 1903. They have an unlimited amount of marl and clay and have in their employ over 100 men. The average monthly pay roll is $6,000. This plant is located at Union City, Michigan, adjoining the tracks of the air line of the Michigan Central, under the supervision of J. R. Patterson.

TOLEDO PORTLAND CEMENT CO.

This plant is situated at Manchester, Lenawee County, Michigan. When completed it will be one of the best of its size in the state. The buildings are about ready for the machinery, and the boilers are on the ground ready to be set. They own 400 acres of good marl land and have the right of way for a private railroad to the main line, part of which is now complete.

The company expects to complete the entire plant and start to manufacture cement in the early spring of 1905. This work is being done under the supervision of their general manager, O. H. Dunham, of Toledo, Ohio.

WYANDOTTE PORTLAND CEMENT CO.

The Portland cement plant at Wyandotte, Michigan, was built in 1899, by the Michigan Alkali Company, manufacturers of soda ash and products at that place. The Michigan Alkali Company operated the plant until the close of 1903, when it was leased to the Wyandotte Portland Cement Company, who now operate it.

The raw materials used are limestone from Alpena, Michigan, and clay from Millbury, Ohio. The Alpena limestone is of coal formation and of unusual purity, averaging 97 per cent carbonate of lime. The Millbury clay is used by several cement mills, on account of its containing the correct proportions of silica and alumina.

The capacity of the plant is 400 barrels per day. The cement is burned in three rotary kilns, and ground in ball and tube mills to such fineness that 95 per cent will pass through a 100 mesh screen. This extra fineness enables the cement to carry more sand in combination and gives increased strength to the concrete made from it.

FROM THE ALPENA PORTLAND CEMENT CO.

We would say in regard to the cement business in Michigan that the industry is still in an experimental stage. Capital put into the building of plants has had no returns in dividends, except in a few instances, for five or six years and the outlook is not encouraging.

It is an "Infant Industry" that needs fostering. There is a great abundance of stone clay and marl in the state suitable for making cement of the highest quality, but the cost of labor and of coal of suitable quality is higher here than in the Pennsylvania district and Michigan manufacturers must compete with Pennsylvania prices.

Instead of fostering the enterprise, it is complained, that it is excessively taxed in many localities in the state.

(*Continued Next Month.*)

The highest bid received under the advertised sale of the Hecla Portland Cement Plant was $400,000, made by S. T. Miller of Detroit, representing a syndicate pledged to take care of $600,000 of the company's indebtedness, the upset price being $750,000. The sale was therefore again postponed to September 27. There is reason to believe that the syndicate will eventually offer $750,000 for the plant.

The Diamond Portland Cement Company will expend $20,000 in improvements. Two new 80 foot kilns will be installed, with a proportionate increase in grinding machinery.

There are over 4,000 concrete building plants in operation in the United States.

In Selma, Ala., parties have bought fifty acres of lime rock land near Epes, bordering on the Bigbee river, paying $10,000 for it, and it is said they intend to build a cement plant.

The California Portland Cement Company's sales for September were greater than during any preceding month for the past twelve years.

The sale of the real and personal property of the Pacific Portland Cement Company, which has been in the hands of S. J. Goodsell, receiver, has been confirmed by Judge Kennan.

The Tennessee Lime and Cement Company have postponed the erection of their cement plant.

The Alabama Portland Cement Company have all the machinery on the ground and part installed to double their capacity. Present yearly output, 150,000 barrels.

The New Castle Portland Cement Company, New Castle, Pa., expect to have their plant in operation about January 1. Output, 500,000 barrels.

The price of Portland Cement is gradually being raised. One manufacturer has raised the price ten cents per barrel during the present month.

The St. Louis Portland Cement Company are increasing their output to 1,000,000 barrels.

A company is being organized at Louisville, Ky., to manufacture the same material under another name, Joseph Murphy being interested in both companies.

One hundred and thirty-nine patents have been issued for cement posts in the United States.

THE OVERLAND LIMITED.

To California in less than three days.

The Overland Limited leaves Union Passenger Station, Chicago, 6:05 p. m. every day. Route: Chicago, Milwaukee & St. Paul Railway, Union Pacific, and Southern Pacific. Less than three days Chicago to San Francisco via Omaha. Descriptive folder free.

F. A. MILLER,
General Passenger Agent,
Chicago.

INCORPORATED.

Karl Dignowitz of Dennison, Texas, has organized a cement stone and brick company. Capital, $25,000.

The Laughlin Hydraulic Stone Co. of Alburquerque has been incorporated. Capital, $30,000.

Metropolitan Stone Co., 1 Montgomery street, Jersey City, N. J.; manufacture artificial stone, terra cotta, and contractors' and builders' supplies; capital, $300,000. Incorporators, Franklin Wagner, 34 Nassau street; Otho S. Lee, Jr., 32 Nassau street, both of New York; George W. Flaancke, as above.

International Armored Cement Co., 50 Farley avenue, Newark, N. J.; manufacture cement products. Capital, $500,000. Incorporators, F. W. Scofield, City of Mexico; Oscar C. Kunze, Newark, N. J.; D. H. Miller, East Orange, N. J.

The Southern Concrete Co. of Mobile, with a capital stock of $5,000, has filed a notice of its incorporation with the secretary of state. The incorporators are W. C. Fritter, Moses Kahn, Aubrey Boyles, and T. G. McGonigal.

Several large blocks of stock of the Alpena Portland Cement Co. have changed hands lately, the purchasers being W. H. Johnson, C. H. Reynolds, and J. H. Cobb.

The Pacific Portland Cement Co., Consolidated, has been incorporated, with a capital stock of $3,000,000, by George Stone, Nathan L. Bell, Morris Kind, A. C. McKenzie, and Winfield K. Brown, all of San Francisco, Cal.

A large Portland cement works will be erected at Independence, Kan., under the supervision of E. C. Soper, late of Iola, Kan. S. S. Northrup of Iola, Kan., and A. B. Cockrell of Nevada, Mo., are financing the enterprise.

The Lancaster Stone Co. of Lancaster, Ohio, has been incorporated, capital $200,000, to manufacture cement and clay products. The incorporators are E. M. Fullington and J. E. Ellis of the state auditor's office, C. S. Frambes of the Thomas Shirt Co. of Columbus, J. A. Taft of the Buckeye Machinery Co .of Columbus, and F. H. Hertel of the Equitable Life Insurance Co. of Columbus.

The National Concrete Stone Co., Camden, N. J., to do a general concrete and paving business. Capital, $100,000. The incorporators are W. B. Harahan, George J. McNeill, Joseph Ranespacker, and Alexander F. McCabe.

Jacob S. Coxey of Mt. Vernon, Ohio, has formed a company, known as the Coxey Egyptian Permanent Stone Block Co., which will build a plant, 114x22 feet, for the manufacture of artificial stone.

The U. S. Cement Machine Co. of Deshler, Ohio, incorporated by F. Henry Mayer, Samuel A. Jones, David A. Hopkinson, S. Cottingham, J. B. Gribbel. Capital, $10,000.

The Portland Concrete Co. of Noble, Ill., incorporated. Capital, $2,500. Manufacturing blocks, building material, and concrete. The incorporators are E. L. Palmer, A. A. Shannon, and others.

The Monarch Metal Fence Co. of Crawfordsville, Ind., capital $30,000, will erect a plant for the manufacture of a composite cement and metal fence post. George B. Luckett, president.

The Modern Building Material and Construction Co. of South Pittsburg, Tenn., has been incorporated, capital $5,000, to manufacture concrete blocks.

The Crystal Lime and Cement Co., Salt Lake City, Utah, was incorporated recently with a capital stock of $100,000, fully paid in.

The Symtion Construction Co. of Conway, Ark., has been incorporated to manufacture concrete blocks.

The Akron, N. Y., Artificial Stone Co.'s plant was destroyed by fire on Sept. 30. Loss, $5,000.

The Columbus Concrete Co. of Columbus, Ga., has applied for articles of incorporation. Capital, $15,000. Those interested in the new enterprise are Messrs. Ernest Hill, John F. Weathers, Frank Sutter, Frank Garrard, J. O. McBride, and W. T. Newman, all of Columbus, Ga.

Incorporated: Steel and Hollow Block Building and Construction Co., New York; manufacture stone. Capital, $100,000. Incorporators, S. Giletti, 1608 Amsterdam avenue; J. H. Tafft and H. R. Wade, 27 Williams street, all of New York.

The Detroit Cement Stone Co. of Detroit, Mich., has increased its capital stock from $25,000 to $100,000. The directors will offer $25,000 of the stock for sale at par value.

J. C. Thorngren will start a concrete building block plant at Pilot Mound, Iowa.

The Fairmont (Minn.) Cement Stone Co. will enlarge its plant to cover 100x50 feet.

The city ordinances of Buffalo, N. Y., permit only three story buildings constructed in reinforced concrete.

The National Portland Cement Co.'s plant has been sold to the Alpha Portland Cement Co. The works are being enlarged. The kilns will be lengthened from 80 feet to 140 feet. The Alpha Portland Cement Co. elected the following officers on Oct. 5: President, A. F. Gerstell, Easton; vice president, J. M. Lockhart of Pittsburg; secretary and treasurer, G. S. Brown, Easton. Directors, W. M. McKelvey, P. C. Evans, G. S. Brown of Easton, John B. Wight of Mount Clair, N. J. The capital of the company is $2,500,000.

The White Portland Cement Co. of Chelsea, Mich., has made an assignment to H. Claude Guerin of Chelsea. Liabilities, $262,613; assets, $64,612. Wm. J. White, manufacture of chewing gum, whose claims exceed $200,000.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	AUGUST				EIGHT MONTHS ENDING AUGUST			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	150.000	$ 1,003	....	....	6.364.856	$ 21.849	6.861,200	$ 21.651
Belgium...........	11,803,138	40,730	8,559,033	$ 23,238	92,938,220	283,598	75,284.148	232,916
France............	....	....	297,600	1,019	10.534,355	35,048	4.323,900	15,321
Germany..........	12,005.460	39,914	13,852,711	53,018	128,486,482	434,965	96,832,081	324,863
All Other Europe	238.097	563	....	....	2,028,202	6,622	240,659	609
British North Am.	60,000	301	....	....	141.560	718	127,660	1.368
Other Countries..	1,217,864	4,595	22,240	168	2,229,812	7,523	469,300	1,781
TOTAL.....	25.474,559	87,106	22,731,584	77,443	242,723,487	790,323	184.138,951	598,509
Domestic Exports of Cement, bbls.	84,966	131,509	125,116	160,757	350,779	516,752	714,585	953,512

There were 6,967,588 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in August, 1905, valued at $21.441, against 13,531.927 lbs in August, 1904, valued at $49,465.

For 8 months ending in August, 1905, there were 68,500 tons of asphalten imported in the United States, valued at $289,410, against 70,090 tons imported in 8 months ending August 1904, valued at $288,859.

CONCRETE WORK IN THE PHILIPPINE ISLANDS.

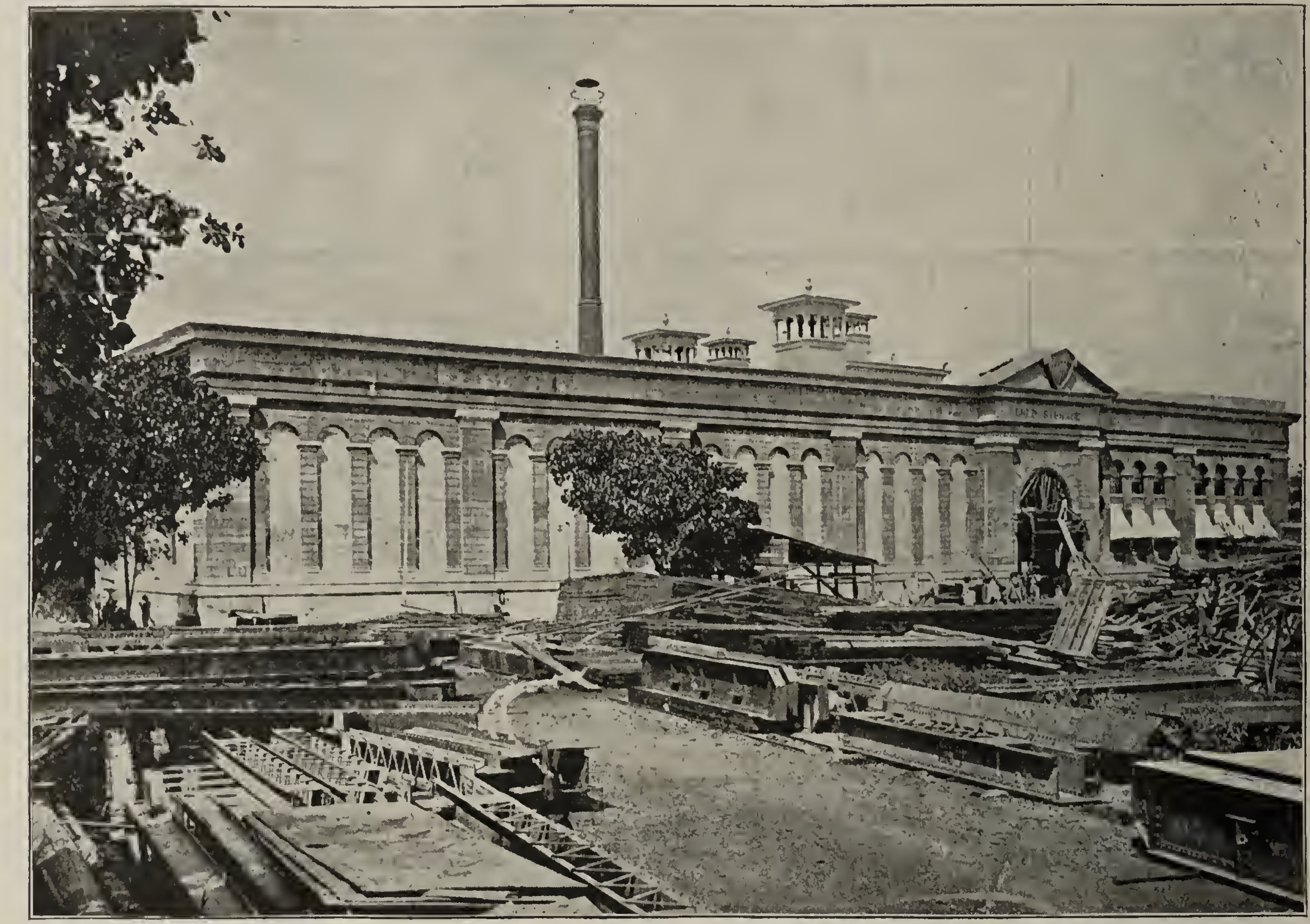
The United States government, through its authorized representative, the Philippine commission, is rapidly introducing concrete construction in the Philippines. The streets of Manila are being graded, filled, and improved with concrete gutters. New streets are being laid out, which afford additional entrances through the old walled portion of the city. The old gates through these walls permitted only one team to pass, under Spanish rule. All this has been changed. The gates are now open to the full width of the streets.

New public buildings are being constructed either of concrete blocks or of plastered walls on expanded metal. The new streets which afford new entrances through the walls surrounding the older portion of Manila are having factory made concrete gutters laid. The gutters are half round troughs, 12 inches wide by 6 inches deep, and cost as high as $3.46 per linear meter (about 3 feet 3 inches). At present concrete gutters are constructed in place, reducing the cost as low as 62 cents per lineal meter.

Our illustration shows the work in progress in Manila streets. On the first page we illustrate the government laboratory building erected at Manila. It is an imposing structure and an innovation in building construction in the Philippines, the walls being six coat cement and lime plaster, on expanded metal, without air spaces in the walls. The building would have been much more suitable for the climate had the walls been made double. As it is, the intense heat in that section will penetrate to the interior, which would have in a great measure been overcome with double walls.

The United States government cold storage plant, constructed in monolithic concrete, is the first concrete structure erected under the American government. Several concrete building block machines are in use on government work in these islands. Bridges and culverts on railroad work are being introduced.

The cement used comes from the Green Island Portland Cement Works, a plant located on Green Island, China, off the coast of Macao, and from several Japanese portland cement works, while several shipments have been made from Brooklyn, N. Y.



U. S. Government Coln Storage Plant, Manila, P. I. Constructed in Monotithic Concrete.

The new portland cement plant to be erected in the San Juan canyon, San Benito county, California, will be operated by electricity generated by water power. The company's engineers are now perfecting surveys and titles to overflow lands that will be affected by the company's proposed dam. As soon as these titles are cleared work on the plant will be commenced. Material for the plant is arriving daily.

CEMENT PLANTS IN RUSSIA.

The total number of Portland cement works in Russia amounts to thirty-four, of which the Grodzill works, in Poland, are the oldest, dating from the year 1856. In the year 1875 the number had risen to five, and ten years later to seven, the dozen being reached in the year 1895, since which year, however, the building of new cement works has gone one at a great pace, until it came to a stop some two or three years ago.

The result of these many new factories was naturally overproduction, with the usual sequel of lower prices; then the production was again reduced, some works temporarily discontinuing the manufacture altogether. The maximum capacity of all the works is estimated at about 8,000,000 barrels, but it is difficult to ascertain the actual output for the last few years; the highest output is probably that of 1901—viz.: 3,720,000 barrels—which, however, does not reach half the aggregate capacity. This figure is the one on record, but it is probable that in reality the output has just exceeded 4,000,000 barrels.

The largest capacity is possessed by the Novorossjski works of the Black Sea Cement Company—viz.: 750,000 barrels. In the year 1900 the output reached 650,000 barrels. Since then the production, in spite of favorable position and excellent raw materials (natural Portland cement stone), has gone down to 400,000 barrels. Next in capacity come the Donez company and the Franco-Russian company, each with 500,000 barrels, the actual output, however, being only about 280,000 and 200,000 barrels respectively.

Out of the thirty-four works already referred to, ten use the wet, two the semi-wet, and seventeen use the dry process. Eleven works manufacture Roman cement, often together with Portland cement.

PROPOSED FIRE RESISTING TESTS OF CEMENT MORTARS AND CONCRETES.

The proposed investigations of the fire resisting qualities of cement mortars and concretes under the joint direction of the American Society of Civil Engineers, American Society of Testing Materials, Joint Committee Concrete and Reinforced Concrete, National Association of Cement Users, National Board of Fire Underwriters, National Fire Protection Association, Association of American Portland Cement Manufacturers, Concrete Block Manufacturers' Association, United States Geological Survey.

The question of the fire resisting qualities of structures in which cement is used as a binder, has been claiming the attention of all constructors for many years, but more particularly since the Baltimore fire, with some experimental work which has given useful information on the subject.

The program for the investigation of fuels by the United States Geological Survey includes tests of the fire resisting qualities of cement mortars and concretes; it has been proposed to carry on similar studies under the joint direction of the National Fire Protection Association and the National Board of Fire Underwriters at the Underwriters Laboratory in Chicago. The Joint Committee on Concrete and Reinforced Concrete of the American Society of Civil Engineers and affiliated societies, the National Association of Cement Users, the Association of American Portland Cement Manufacturers, and the Concrete Block Machine Manufacturers' Association, also contemplated making similar investigations.

In order that these tests should be as exhaustive as possible, it was deemed inadvisable for the various organizations to proceed on independent lines, but to unite in a joint investigation.

Building Concrete Gutters in Manila, P. I.

In response to a call by Mr. Richard L. Humphrey, representatives of the various organizations met at the House of the American Society of Civil Engineers, No. 220 West Fifty-seventh Street, New York, on Tuesday, September 5, 1905, at 10 A. M.

There were present representatives of the American Society of Civil Engineers, American Society for Testing Materials, National Board of Fire Underwriters, National Fire Protection Association, National Association of Cement Users, Association of American Portland Cement Manufacturers, Concrete Block Manufacturers' Association, and the United States Geological Survey.

The object of the meeting was explained and after some discussion, it was decided to organize a committee for the joint investigation of the fire resisting properties of cement mortars and concretes by the above named societies.

The committee organized by the election of Mr. Richard L. Humphrey, Chairman, and Mr. Robert W. Lesley, Secretary pro tem.

A plan for the proposed investigations was submitted by the chairman and was discussed at length and as amended was adopted as follows:

The first series of tests will be made on sand mortars, no facing being used in the manufacture of the block, which will be of a standard size, 9x12x24.

Another series will be made, using dry, medium and very wet mixture, using three grades of mortars for each condition, viz: rich, medium and lean.

A series of blocks will be made under the direction of the Committee of the Concrete Block Manufacturers' Association, in accordance with common practice.

It is proposed to build a test oven, in accordance with the following specifications: Three blocks of each series will be submitted to the test, two with the face towards the inside of the furnace and one with the back of the block facing the inside of the furnace. The blocks are to be laid in lime mortar, and four three-inch diameter Bunsen burner jets with a fire brick baffle will be used for heating the furnace. It is proposed to raise, at a uniform rate, the temperature of the test oven to a temperature of 1800 degrees Fahrenheit during a period of one and one-half hours and maintain this temperature for one-half hour. It is then proposed to turn two streams of water of twenty pounds pressure at the nozzle, against the inner walls of the test chamber from points diagonally opposite each other, for a period of five minutes.

At the conclusion of the test, wherever possible, it is the intention to make a determination of the strength and other physical properties.

The meeting then adjourned to meet at the call of the Chairman.

It is hoped that these investigations can be carried to a successful conclusion in order that the subject may be exhaustively investigated.

Suggestions will be welcomed as to the best methods of procedure and tests to make; and it is hoped that the work will receive cordial support.

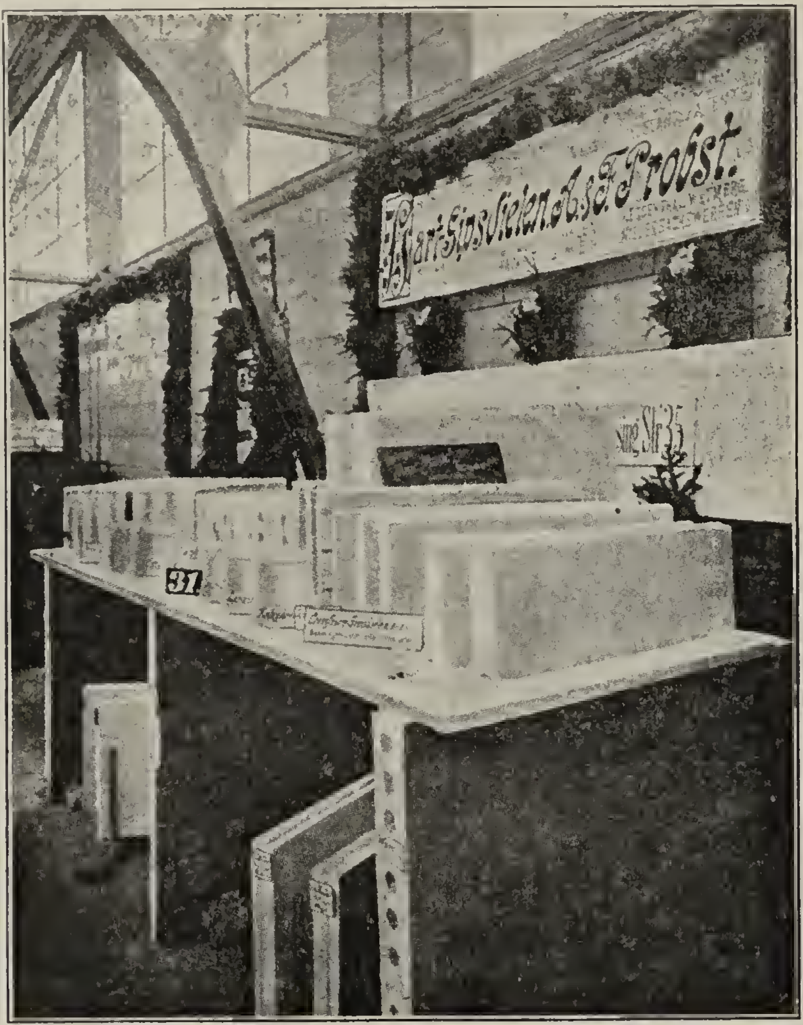
Richard L. Humphrey.

The Round Top Cement Company of Hancock, Md., has made its first shipment from its new plant. The rock from which this cement is made was discovered by A. B. McFarland of Washington, D. C. In 1838 the first concrete was marketed by George Schafer, who operated the plant up to 1863, when it was taken over by Bridges & Henderson, who sold out in 1903 to the present company.

GERMAN CONCRETE BUILDING BLOCKS.

Our illustration shows the exhibit of concrete building blocks or plates at the Clay Cement Lime Exhibition at Berlin, Germany, being the product of F. Probst of lower Saxony. The blocks are produced by the dry tamping process.

The identical same form of blocks have been manufactured of cement and fine crushed furnace slag in Chicago. The finish is excellent. Expensive forms were used for ornaments in relief. Several handsome buildings were erected by an expert German workman who could not make the industry pay in competition with the hollow concrete block. The industry was therefore abandoned.



German Concrete Building Blocks.

THE CEMENT WARE PRODUCTS IN GERMANY.

We are far behind Europe in the production of cement ware. Great industries in this line exist in various portions of Europe which are still undeveloped in this country. In Germany this industry is highly developed in many special lines. More than 1,200 cement ware factories are now in operation, eighty mosaic and Terrazzo plants, Terrazzo being a waterproof tile. There are 490 artificial stone plants producing building materials. The hollow concrete building block is not yet developed in Germany on the scale that we find it in this country.

The building block is in the form of plates with round openings, such as are used for interior partitions in this country. For the past two years the manufacturer of hollow concrete blocks has been taken up and numerous patents for machines which are more or less imitations of American machines. Labor being cheap in Germany, labor saving devices are not absolutely essential. The German product as a rule is good; nothing is done slipshod. The authorities are strict in the enforcement of sound products in all classes of building materials, except in materials that go into one story cottages; for these anything goes. In some of the Rhine provinces Schwemmstein brick is used, made of natural cement and pumice stone aggregates. They are so frail that they will scarcely bear handling, and require an overhanging roof to protect them from the elements. These Schwemmstein are extensively used for partitions in the better class of buildings. The term Schwemmstein, translated, means a stone that swims or floats.

There are one hundred factories producing woven wire for reinforcing cement pipe, round and egg shaped cement sewer sections. The clay roofing tile industry, which up to ten years ago had a clear field, has been outstripped by the cement roof tile, one company having three branches in Germany producing cement and concrete products, such as building stone, caps, sills, steps, bridge materials, carriage blocks, hitching posts, newel posts, balusters, water troughs, relief ornaments and numerous other products sold in 1900 goods valued at $1,080,000. This shows what can be done with ample capital and well directed enterprise in cement products. What is being done in Germany can not only be done in this country but can be increased many fold. The city of Toronto has one artificial building stone factory employing over one hundred men. This company can not keep up with its orders. One large cement product at Pittsburg with the latest labor saving devices is doing a large business. What this country needs is to copy the German cement products industry outside of the concrete building block industry, in which we excell the world in economy and rapidity of construction.

The Pyramid Portland Cement Company has been organized in Kansas City, Mo., and has secured charter under the laws of the state of New York, where it maintains an office, and it has also complied with the laws of the state of Missouri.

The property of the company is located in the suburbs of Kansas City, Mo., and consists of 120 acres of lime carbonate rock nearly two hundred feet in height, covering the entire 120 acres and underlaid but still above grade with a twenty foot bed of shale. The rock and shale has been analyzed by several assayers, including the geological departments of the states of Missouri and Kansas, and it has been found to be the equal in every respect of the great lime beds of Kansas and is practically the same formation, excepting that by an upheaval of nature it has been thrown above the surface of the surrounding territory. Three railroads—the Atchison, Topeka and Santa Fe, Missouri Pacific, and the Kansas City Belt Line—run beside the property, and it has a wharfage of nearly three-quarters of a mile on the Missouri river.

For fuel the company can use oil, which can be obtained in unlimited quantities at the great oil refinery of the Standard Oil Company, which is situated on the adjoining property, or it can use natural gas, of which there are several wells in the vicinity, and coal can be obtained over any of the railroads or by river transportation, delivery being right on the grounds in either event; and the company also has the choice, if it so desires, of mining coal on its own land, as it has a good twenty-eight inch vein at a depth of 360 feet.

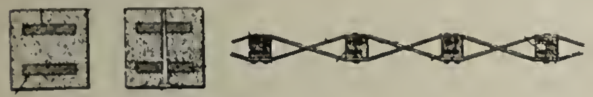
The company is capitalized at $700,000 and will commence the erection of a plant immediately.

With the natural advantage of a short railroad haul, being located right in the limits of Kansas City, the company naturally expects to control the cement market of Kansas City and vicinity, as there is no other cement plant within 150 miles.

U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

799,988. Partition-Wall Construction. Frederick L. Kane, New York, N. Y. Filed Nov. 29, 1904. Serial No. 234,711.

Claim.—1. In a structure such as described, the studding comprising

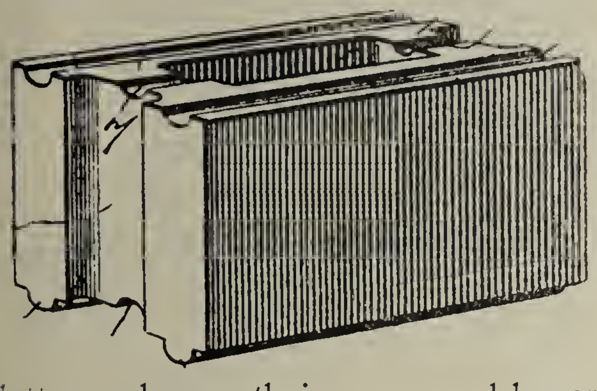


parallel wooden slats, means for holding the slats in parallel relation while the studding is being made, and a cement-like composition embedding the slats and forming the body of the studding.

2. In a structure such as described, the studding comprising parallel slats spaced apart and connected by braces, and a cement-like composition embedding the slats and forming the body of the studding.

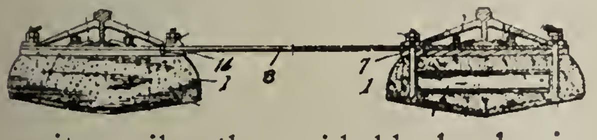
800,067. Hollow Cement Building-Block. Hial D. Brooke, San Francisco, Cal., assignor to William Kolman, James W. Butler and Courtney Van Riper, San Francisco, Cal. Filed Nov. 4, 1904. Serial No. 231,464.

Claim.—A hollow building-block comprising a pair of spaced side sections and transverse connecting-webs producing an enlarged central opening in the block, said webs being provided at their outer faces and at the ends of the block with grooves or channels disposed transversely of the latter and upon their upper and lower edges with grooves extending in a direction longitudinal of the block, the latter grooves being situated at a point between the side sections and adapted to communicate with the end channels and central opening, and a longitudinally extending tongue provided on one side edge of each of the sections, the opposite edge of each section being provided with a corresponding longitudinal groove.



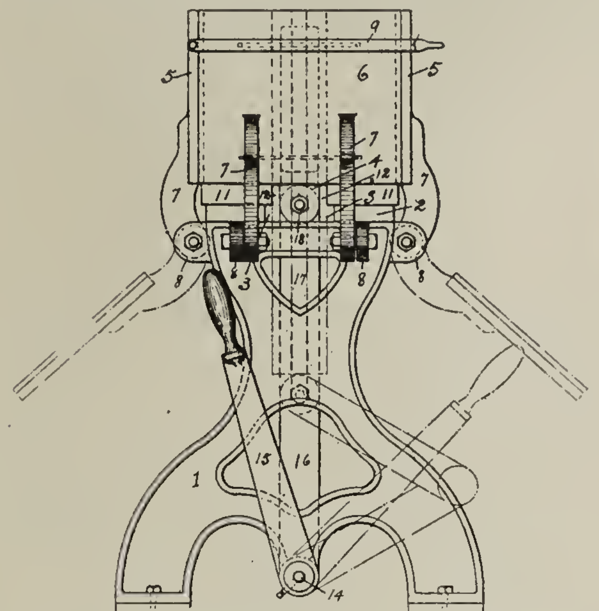
800,344. Railroad-Tie. Peter G. Van Tongeren, St. Anne, Ill., assignor of one-half to Cornelius J. Westerhoff, Chicago, Ill. Filed Feb. 24, 1905. Serial No. 247,167.

Claim.—1. In a railway-tie, two concrete blocks disposed to carry opposite rails, the said blocks having strengthening-strips along their under surfaces, a flexible plate disposed in a horizontal plane upon the upper surfaces and connecting the two blocks and bolts passing through the strengthening-strips and the plate and rigidly clamping the blocks there between.



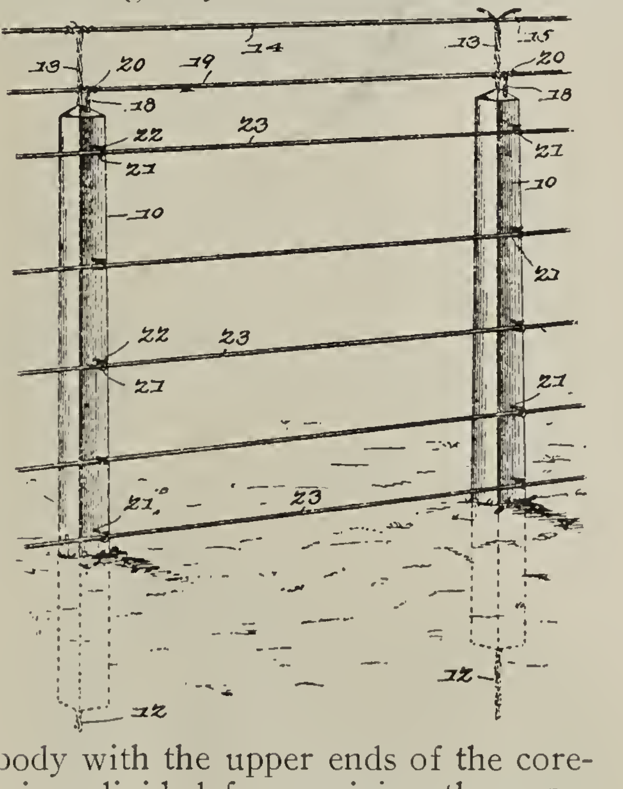
800,138. Machine for Molding Concrete Bodies. John B. Coryell, Adrian, Mich. Filed Dec. 21, 1904. Serial No. 237,747.

Claim.—1. In a machine the combination with the molding-chamber, of a core vertically movable in said chamber adapted when raised therein to divide said chamber into two independent molding-compartments and provided with a series of transversely-disposed slots for receiving uniting-rods for the independently-molded bodies, said slots extending only a portion of the depth of the core.



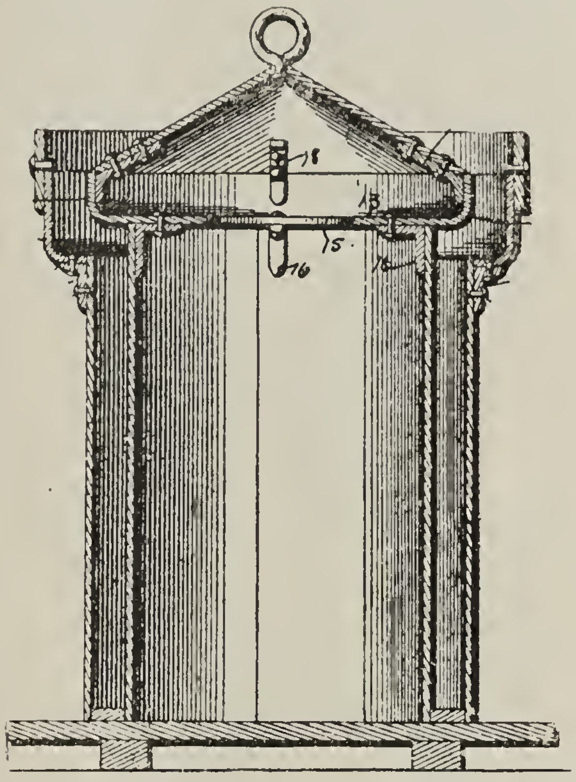
800,265. Fence-Post. Orrin W. Carpenter, Coon Rapids, Iowa. Filed Jan. 19, 1905. Serial No. 241,814.

Claim.—1. A fence-post comprising a continuous concrete body having a longitudinal core of two or more wires twisted about each other and extending beyond the ends of the body with the upper ends of the core-wires divided for receiving the upper strand-wire of the fence and coiled around the same, and spaced core members formed of two or more wires twisted about each other with one of said spaced core members extending above said body and divided for receiving one of the strand wires of the fence and coiled about the same.



800,221. Mold for Making Tile. Charles S. Larimer, Sac City, Iowa, assignor to The Cement Tile and Tile Mold Manufacturing Company, Sac City, Iowa. Filed May 26, 1905. Serial No. 262,514.

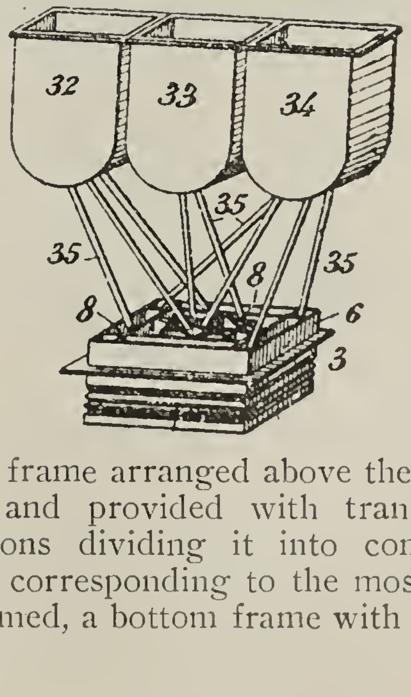
Claim.—1. In a mold for making tile, a disk having a central opening and an upturned flange at its circumference and angle-irons fixed to its bottom in combination with the top of the inner cylinder of the mold.



2. In a mold for making tile, two concentric cylinders and the inner cylinder extended above the top of the outer cylinder, a disk, larger in diameter than the inner cylinder, having a central opening and an upturned flange at its circumference and angle-irons fixed to its bottom and a detachable cone-shaped cover fitted to the flange of the disk.

800,338. Apparatus for Use in Manufacturing Mosaic Tiles or the Like. Louis Streuli, Zurich, Switzerland. Filed Nov. 3, 1904. Serial No. 231,218.

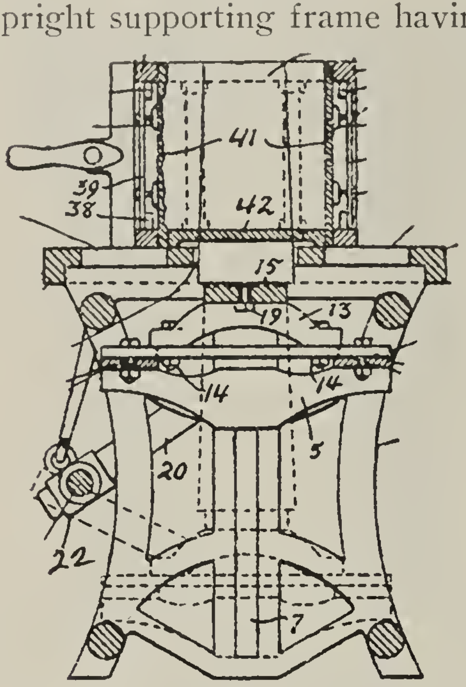
In an artificial stone press, an intermittently rotating press-table carrying molds, in combination with an upper frame arranged above the press table and provided with transverse partitions dividing it into compartments corresponding to the mosaic to be formed, a bottom frame with trans-



verse partitions also dividing it into similar compartments, flexible partitions connecting the partitions of the upper frame with those of the bottom frame and means for lowering the bottom frame into an empty mold on the press table, and raising it again after the mosaic material has been deposited on the bottom of the mold, substantially as described.

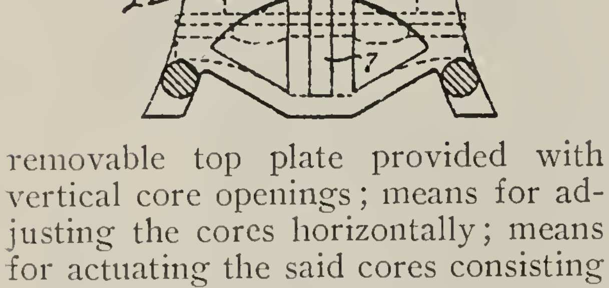
799,611. Machine for Manufactur- Hollow Concrete Building Blocks. John W. Miller, Auburn, Ind., assignor to Concrete Block Machine Company, Auburn, Ind. Filed Aug. 22, 1904. Serial No. 221,601.

In a hollow building block machine an upright supporting frame having a removable top plate provided with vertical core openings; means for adjusting the cores horizontally; means for actuating the said cores consisting of a longitudinally-slotted plate on which the cores are adjustably mounted; a bracket supporting the said plate and adapted for a vertical guided reciprocation in the frame, levers pivotally connected to the said bracket, and fulcrumed on pendent pivoted arms, and an operating handle for said levers; and a mold formed of hinged and pivoted sections removably mounted on said table.



799,828. Flash-Board Holder for Dams. William L. Church, Newton, Mass. Filed June 2, 1905. Serial No. 263,447.

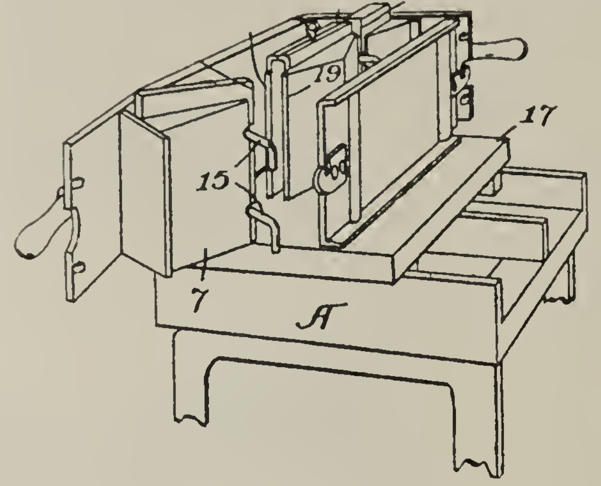
Claim.—1. A dam having at its crest a series of guides, and flash-board supporting posts movable in said guides.



2. A dam having at its crest a series of guides, and posts movable endwise and rotatable in said guides, and provided with ears or lugs adapted to engage the upper edges of flash-boards.

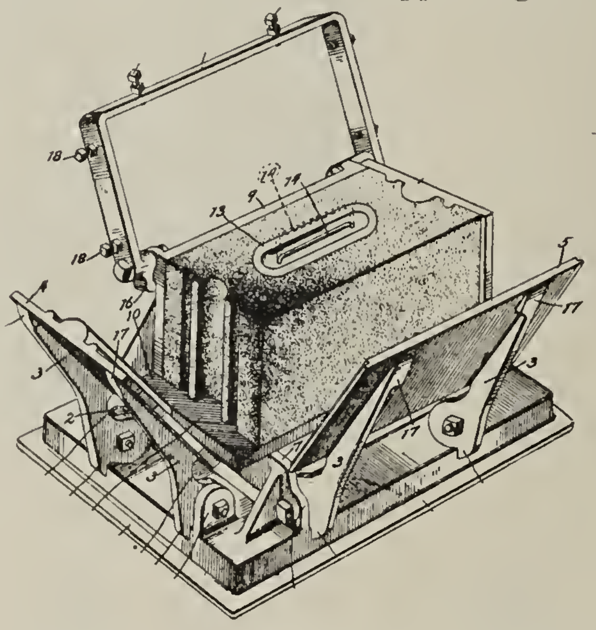
799,709. Moulding Machine. Charles W. Bradley and John Olsen, Rock Rapids, Iowa. Filed April 27, 1905. Serial No. 257,584.

A device of the class described, comprising a base, pallet and side and end plates, in combination with a core composed of a division piece having leaves and spreaders for said leaves hinged to the end plates.



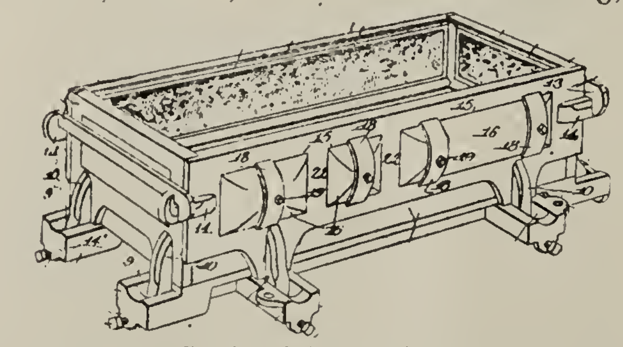
799,871. Molding Machine. Philip Savard, Chicago, Ill., assignor of one-half to Robert C. W. Timm, Chicago, Ill. Filed March 6, 1905. Serial No. 248,679.

Claim.—1. In a molding machine, the combination with the machine frame and means for supporting the material to be molded, of a plurality of walls at least three of which are pivoted to the machine frame; and a binder pivoted to a fixed portion of the machine and adapted to simultaneously engage all of the pivoted walls for forcing the same toward each other upon the material to be molded.



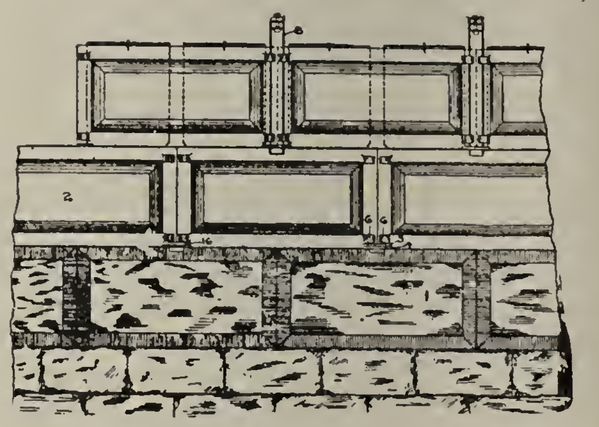
799,754. Pattern Frame for Cement Molding Machines. John B. Petrie, Celina, Ohio. Filed Feb. 23, 1905. Serial No. 246,929.

Claim.—1. In a mold, a base, side and end walls carried by the base and provided with seating recesses, pattern plates seated in said recesses, locking straps carried by the plates and adapted to engage the walls of the mold, and a clamping means engaging said plates and straps, respectively.



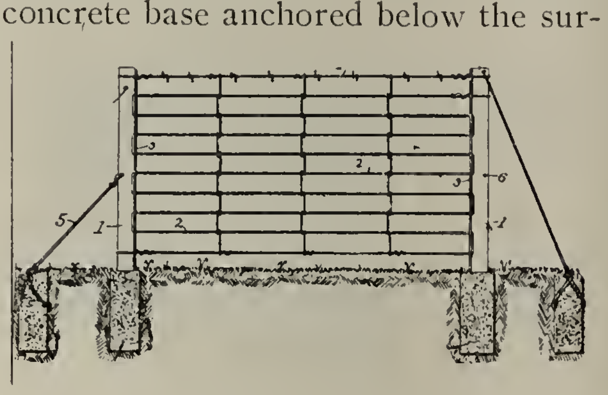
799,914. Mold for Concrete Walls. Alva S. Merriett, Kansas City, Kans. Filed April 10, 1905. Serial No. 254,625.

In a device of the class described, the combination with a set of front and back plates, of lugs on the ends of said plates, stay-plates supporting said front and back plates, and a brace bar.



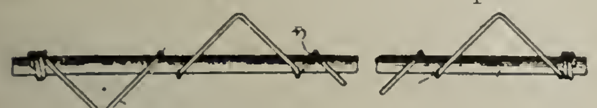
798,946. Fence Post. Moses K. Blackburn, Fredericktown, Ohio. Filed Jan. 7, 1905. Serial No. 240,070.

Claim.—A fence post composed of metal of right angled cross section, secured at its lower end in a molded concrete base anchored below the surface, one flange or arm of said post being provided with two sets of slitted openings, having laterally deflected closing flanges, and the other flange or arm of the post being provided with a plurality of guy or brace wire receiving openings, in combination with molded concrete anchors or boulders buried in the ground, and guy-wires secured to said anchors or boulders by passing and twisting the lower portion of each about the boulder and twisting the lower end into a substantial knot about the body of the wire just above the anchoring boulder, said wires or cables being passed at their upper portions through the said brace-wire-receiving openings and fastened therein.



799,230. Means for Reinforcing Concrete. William Gabriel, Detroit, Mich. Filed Oct. 14, 1904. Serial No. 228,400.

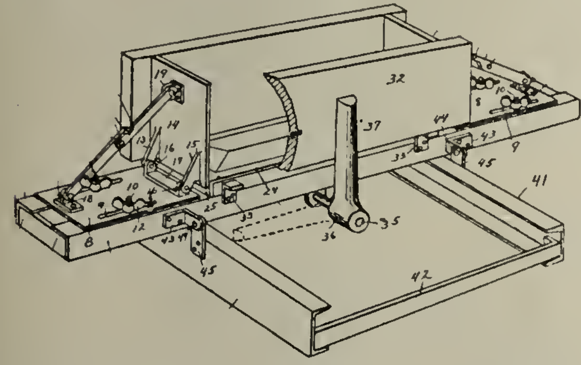
Claim.—1. A composite bar for reinforcing concrete comprising a bar and a continuous piece of wire or its equivalent, said wire secured at its ends to the ends of the bar and wound around said bar at intervals apart and



alternately in opposite directions, the wire between said intervals of winding being formed into stirrups which extend upwardly and outwardly from the bar and alternately on opposite sides thereof in two planes inclined toward each other in the form of a V and intersecting each other at a point directly above the bar.

799,493. Mold for Artificial Stone. John Pfeiffer, Excelsior Springs, Mo. Filed April 28, 1905. Serial No. 257,896.

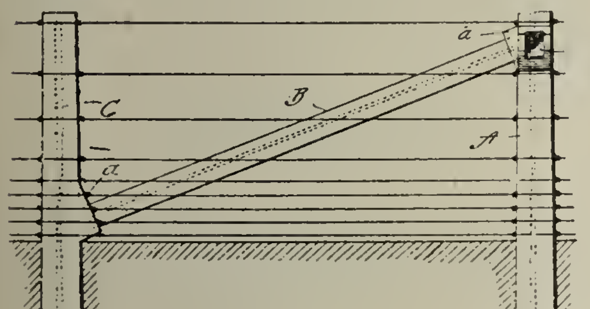
Claim.—1. A mold comprising a bottom and separate transverse plates adjustably connected with said bottom, separable sides to the mold, means for



supporting said sides in an upright position, outwardly-inclinable ends to said mold upon said adjustable plates, said plates and ends being movable longitudinally upon said bottom between said sides of the mold and sectional locking-bars pivoted to the ends of the mold and the said adjustable supporting-plates.

799,515. Concrete Fence Post. Lewis H. Benedict, Oxford, Ind. Filed June 22, 1903. Serial No. 266,484.

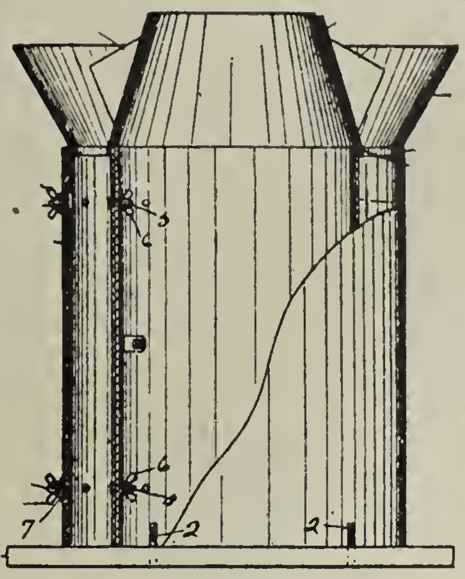
Claim.—1. A concrete fence post



having an integral triangular projection on the side thereof, said projection having a brace-receiving recess in one of its faces.

799,559. Mold for Cement Tile. John Groscop, Auburn, Ind. Filed March 16, 1905. Serial No. 250,375.

Claim.—1. In a tile-forming mold or apparatus, an inner and outer upright cylindrical casing in concentric relation with an interposed annular chamber, the said casings being open at both ends; the outer lapping edge of the outer casing having a plurality of slots coincident with bolt-openings in the inner edge adapted to receive securing-bolts by which the cylinder can be expanded or contracted diametrically; a supporting base for the said mold having a series of radially-arranged removable centering-pins,

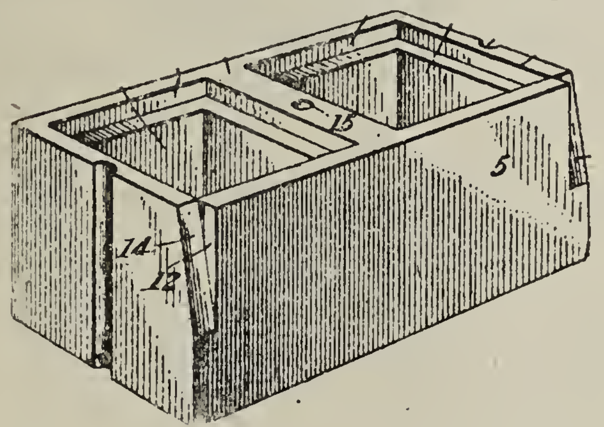


and a funnel removably mounted upon said casings consisting of two concentric sections oppositely flaring and rigidly connected as described.

800,385. Building Block. John H. Miller, Risingsun, Ohio. Filed March 2, 1905. Serial No. 248,134.

Claim.—1. A building-block comprising a body portion provided with oppositely disposed joist receiving each of which is disposed at the juncture of one of the side and end walls of the block, said recesses having their rear walls inclined toward the bottom of the block.

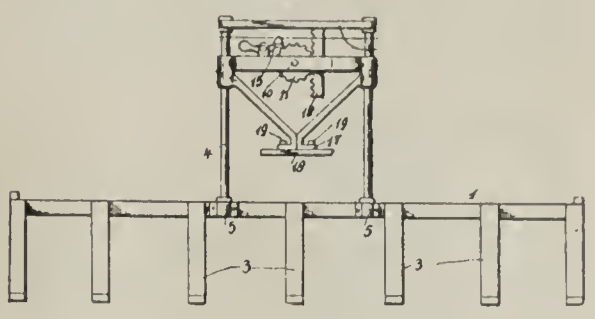
2. A building block comprising a



body portion provided with a plurality of air-flues, seating-grooves formed in the top of the block and surrounding said flues, marginal locking-flanges surrounding said flues at the bottom of said block, and a joist-receiving recess formed at the juncture of one of the side and end walls thereof and inclined toward the base of the block.

800,393. Concrete Block-Forming Machine. Albert A. Pauly, Youngstown, Ohio. Filed July 10, 1905. Serial No. 268,994.

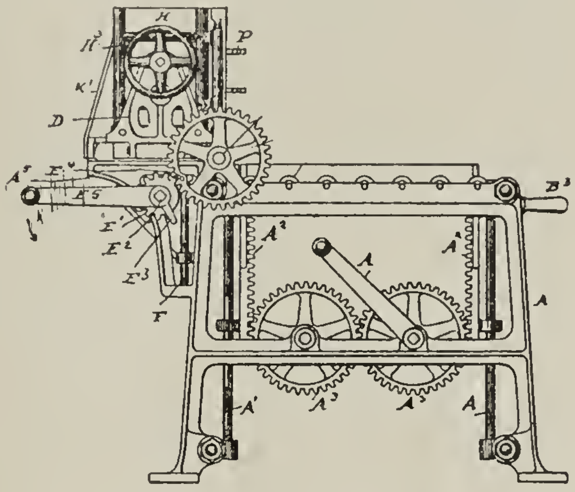
The combination with a frame having rollers journaled therein, of standards carried by said frame, a plate connecting said standards together, a frame slidably mounted upon said standards, a plunger carried by said standards, a shaft journaled in said frame and having suitable crank-handles, a toothed wheel mounted upon said shaft, a rack carried by said plate and meshing with said toothed



wheel, a pawl pivotally mounted upon said frame and normally engaging said toothed wheel, substantially as described.

799,385. Machine for Making Artificial Stone Blocks. Julius Jaeger, Rutherford, N. J. Filed Feb. 13, 1905. Serial No. 245,406.

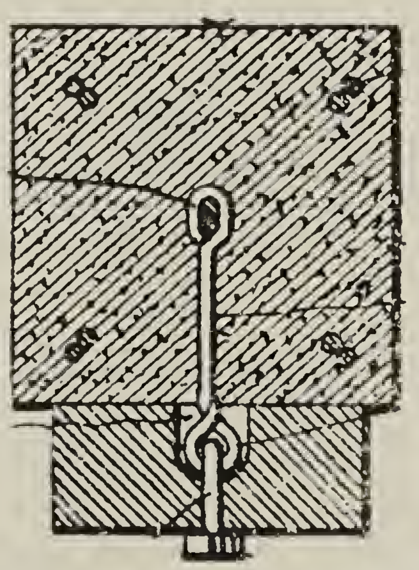
Claim.—1. In a machine for molding blocks, the combination with a



pivoted molding-box, of a removable bottom pattern-plate, means for tilting said box and means for lowering said pattern-plate out of the box, substantially as set forth.

800,406. Fence Post. Joseph Schneider, Rudolph G. Schneider, and Friedrich C. Richmann, Denver, Iowa. Filed May 20, 1905. Serial No. 261,356.

An artificial-stone post having retaining members embedded therein, said members being projected beyond

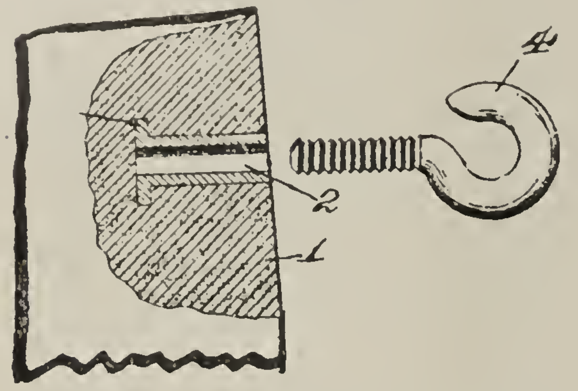


one face of the post and provided at their outer ends with eyes, an attaching-strip designed for application to the post, and fastening members entered through the strip and having their inner ends formed for engagement with said eyes.

800,427. Composition Post. Henry

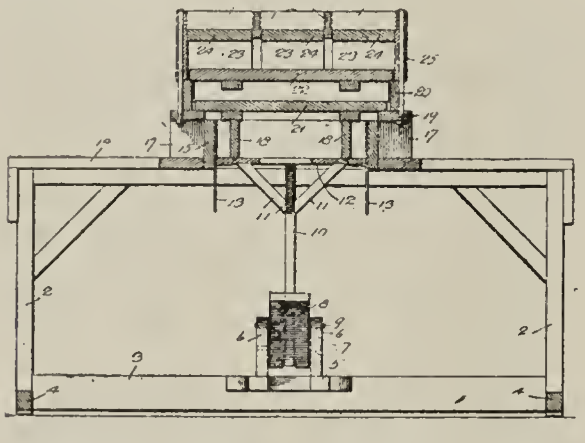
H. Clough, Elyria, Ohio. Filed June 5, 1905. Serial No. 263,722.

The combination with a concrete structure, of soft-metal sleeve-sockets having a cylindrical bore embedded in the body of the concrete and fastening devices having threaded shanks of larger diameter than the bores of the socket-sleeves and forcible into screw-threaded engagement therewith, substantially as described.

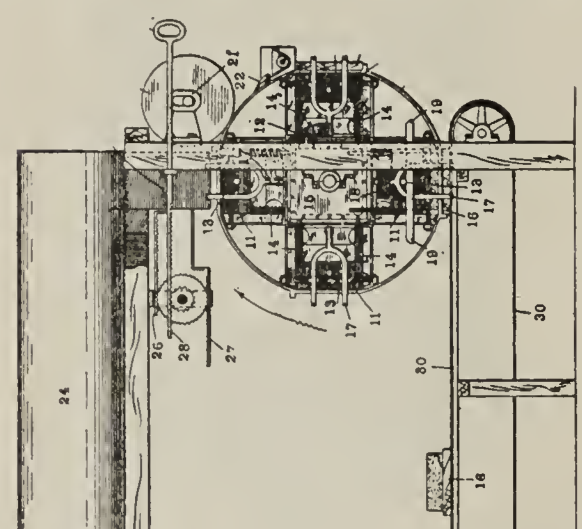


800,501. Concrete-Block Mold. Fred Simonsen, Graettinger, Iowa. Filed June 29, 1905. Serial No. 267,639.

In a machine for molding blocks, a frame, a table, a mold-box secured thereto, a series of brackets secured to said mold-box, a rim supported upon said brackets, a second mold-box supported upon the said rim, a foot-lever, a mold bottom or plunger supported upon said foot-lever, and means for adjusting the throw of said foot-lever, substantially as described.

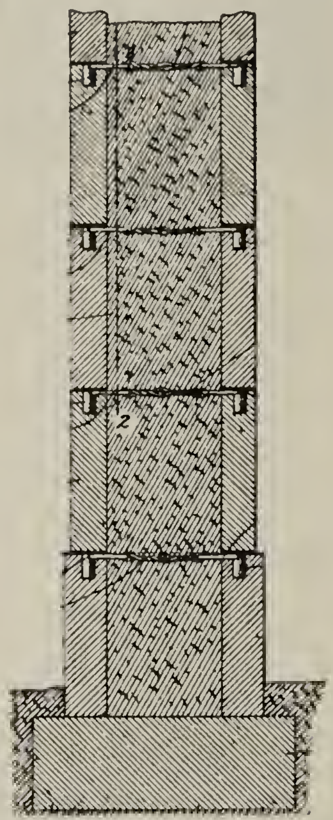


798,599. Cement Brick-Making Machine. Winburn F. Conrad, Indianapolis, Ind., assignor of one-half to Charles A. Owen, Indianapolis, Ind. Filed Sept. 17, 1904. Serial No. 224,891.



3. In a cement brick-forming machine, the combination of a rotatable drum, a plurality of open-ended molds carried thereby and movable radially therein, a plurality of abutments fitting one in each of said molds and forming a closure for the inner end thereof, means for securing a pallet adjacent each of said molds in position to form a closure for the outer end of the mold, means for retracting the mold over its abutment whereby the mold may be stripped from the brick, a pressure-roller arranged adjacent the drum in position to exert pressure upon a freshly-filled mold.

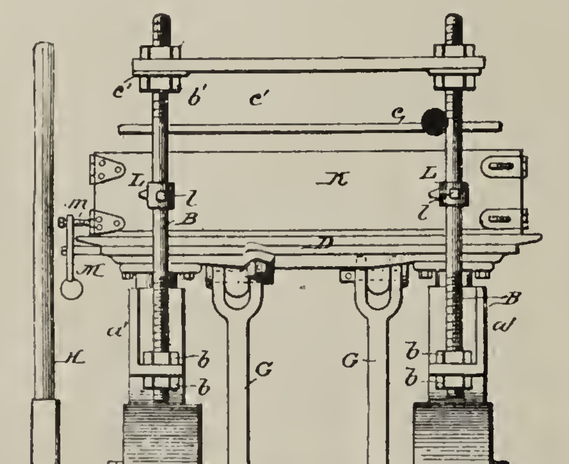
798,773. Wall Construction and Blocks Therefor. George F. Fisher, North Tonawanda, N. Y. Filed Aug. 5, 1904. Serial No. 219,647.



Claim.—1. In a building construction, two rows of building-blocks having opposing fastening-irons and wire connections delivery and take-up rollers for said band said rollers being carried by and located under said bed and having squared key-winding ends normally registering with said keyholes.

798,900. Cement-Block Press. Erastus H. Harry and Isaac L. Shaw, Gibson City, Ill. Filed March 23, 1904. Serial No. 199,629.

Claim.—1. In a press of the character described, the combination of two parallel, vertical, supporting-frames A having lateral flanges a^2, vertical posts B supported on said flanges, a head-platen applied to the four posts and connecting the same at the top, and the movable platen having pendent guide-rods E, the aforesaid frames having vertical bearings for said rods, all the aforesaid parts being detachably connected, substantially as described.



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F. A. MILLER,
General Passenger Agent,
Chicago.

ACID PROOF CEMENT.

Hugo Gallinowsky is promoting a company at Louisville, Ky., for the manufacture of an acid proof cement. The product is to be used in the manufacture of sanitary flooring. Kennett McDonald and D. X. Murphy are interested parties. A plant using this cement is said to be in operation in Canada. The Louisville promoters expect to invest from $150,000 to $200,000 in the enterprise.

The Denver and Rio Grande railway is erecting a concrete roundhouse for twenty locomotive stalls at Pueblo, Colo.

BOOK NOTICES.

"Calcareous Cements: Their Nature, Manufacture, and Use," by C. R. Redgrave and Charles Spackman. 310 pages, 63 illustrations. J. B. Lippincott, publisher, Philadelphia. Price, $4.50.

This treatise thoroughly covers the technical side of cement manufacture and is undoubtedly the best work that has appeared in the English language. It contains about all the wrinkles which have been developed on the practical side of cement manufacture up to date.

The rotary kiln is not as fully described as might be expected from a distinctive American standpoint, due to small extent to its use in Europe. All other machinery and appliances are fully covered.

LAND BRICK LOCATIONS.

The newly established Industrial Department of the Northwestern Line is calling attention to the many natural advantages that exist along its road for the manufacture of brick and tile. They find in their investigation that the new process for the manufacture of brick by the use of a suitable quality of sand has brought to notice several fine deposits of this material at widely separated points on its system. This presents additional opportunities to those concerned in the manufacture of brick and opens a wide field from which a choice of location can be made and good surrounding markets obtained.

CEMENT WATERPROOFING SOLUTION.

The Sylvester water proofing solution for water proofing concrete is as follows: Dissolve twenty-five pounds of alum in one barrel of water; in a second barrel of water deposit forty quarts of soft soap; mix well; moisten the concrete with the soap solution, being sure that the surface is thoroughly covered; follow with the alum solution, which may be applied with a sponge. Several applications should be made at intervals. The Sylvester process answers very well for rough work. The concrete should be dry and the solutions may be used hot and applied with a brush.

A HIGH CONCRETE CHIMNEY.

The Butte Reduction Works of Butte, Montana, has just completed a concrete chimney, 354 feet high, at a cost of $30,000. Sixty-five tons of T bars and 1,600 barrels of Portland cement were used in its construction. It has an interior diameter of eighteen feet throughout. The foundation is forty-two feet six inches square. The entire structure weighs 1,500 tons.

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NATURAL GAS PRODUCTION.

The production of natural gas in 1904 in the United States was approximately 256,645,000,000 cubic feet, or 6,159,480 tons of 2,000 pounds, valued at $38,496,760, showing an increase in value of $2,688,900 over the production of 1903.

Pennsylvania, West Virginia, Indiana, and Ohio produced 93.3 per cent of the output in 1904. The output of Pennsylvania represented 47 per cent of the entire value.

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The Speeds Portland Cement Plant now under construction at a point ten miles north of Jeffersonville, Ind., is being rushed to completion. An electric light plant has been installed to enable night work to be carried on. January 1, 1906, is the time set for starting up the plant.

The Chicago Portland Cement Company are increasing their capacity to 800,000 barrels.

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Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

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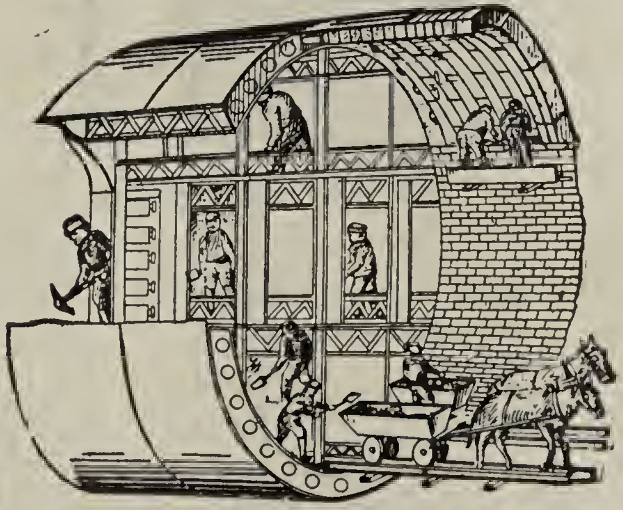

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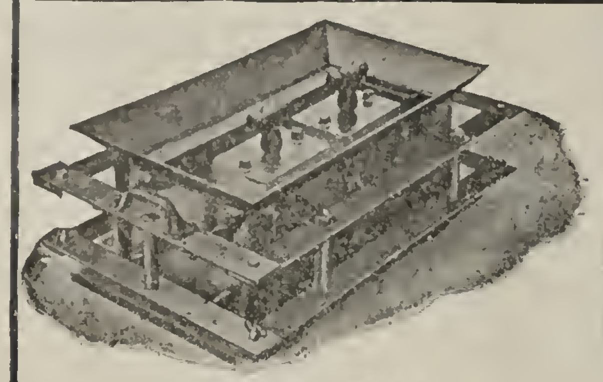

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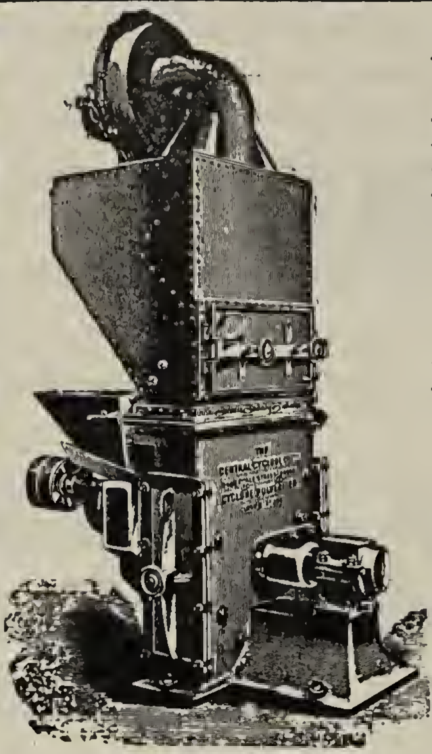

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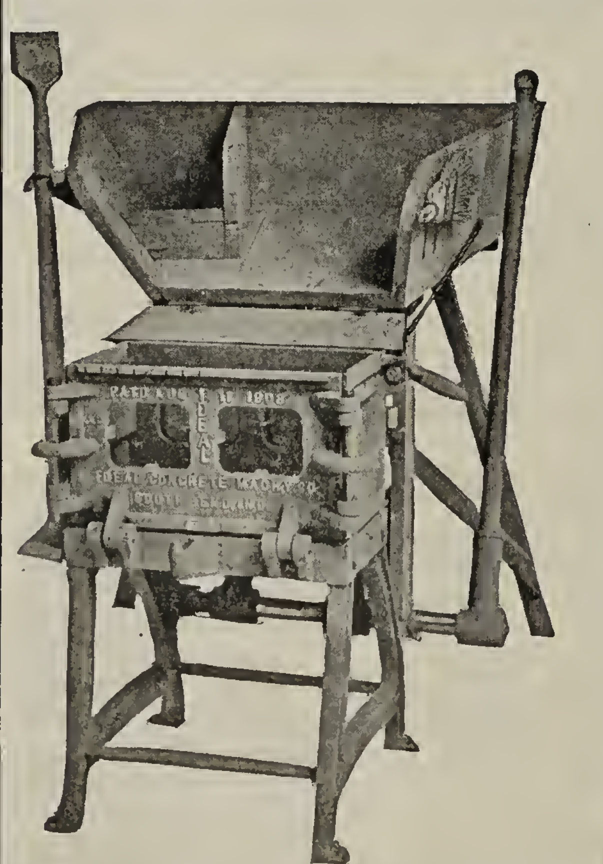

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The Sandusky Portland Cement Company has purchased 225 acres of land east of Dixon, Ill., upon which a 2,000 barrel mill is to be erected to work the shale and lime rock deposits. The mill building will be constructed in reinforced concrete. There is said to be an available water power on the Rock river at Grand Detour, north of Dixon.

The firm of Dykema & Son of Grand Rapids, Mich., has filed a petition in bankruptcy. Liabilities, $19,142.29, principally due to newspapers on advertising contracts. The firm has exempt assets amounting to $14,275.03, leaving $4,867.26 to satisfy unsecured creditors. Dykema & Son have been engaged in the sale of forms for the manufacture of poured concrete building blocks and maintained offices at Grand Rapids, Mich., and New York City.

The Iola Portland Cement Company will expend $250,000 in improvements and enlargement of its plant. The above named sum has been set aside from the company's earnings.

The Dexter Portland Cement Company's output next year will be 600,000 barrels.

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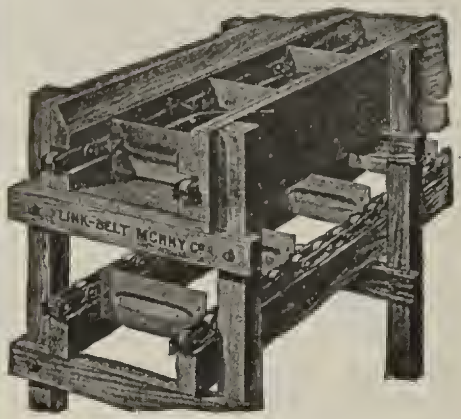

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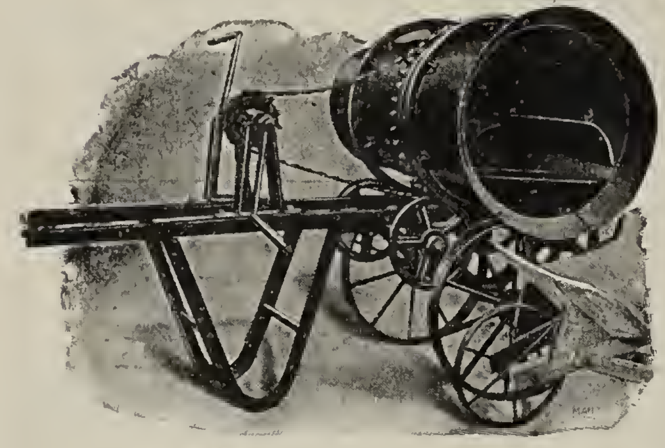

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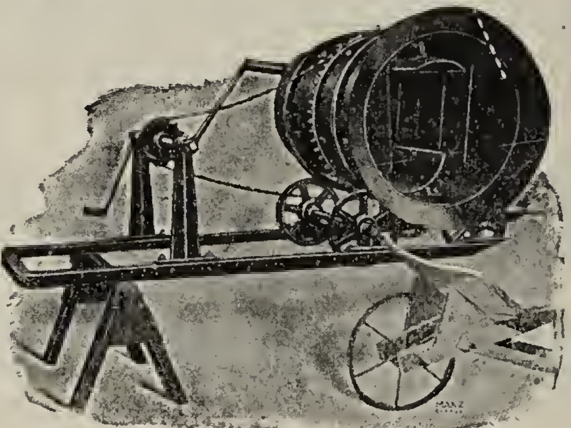

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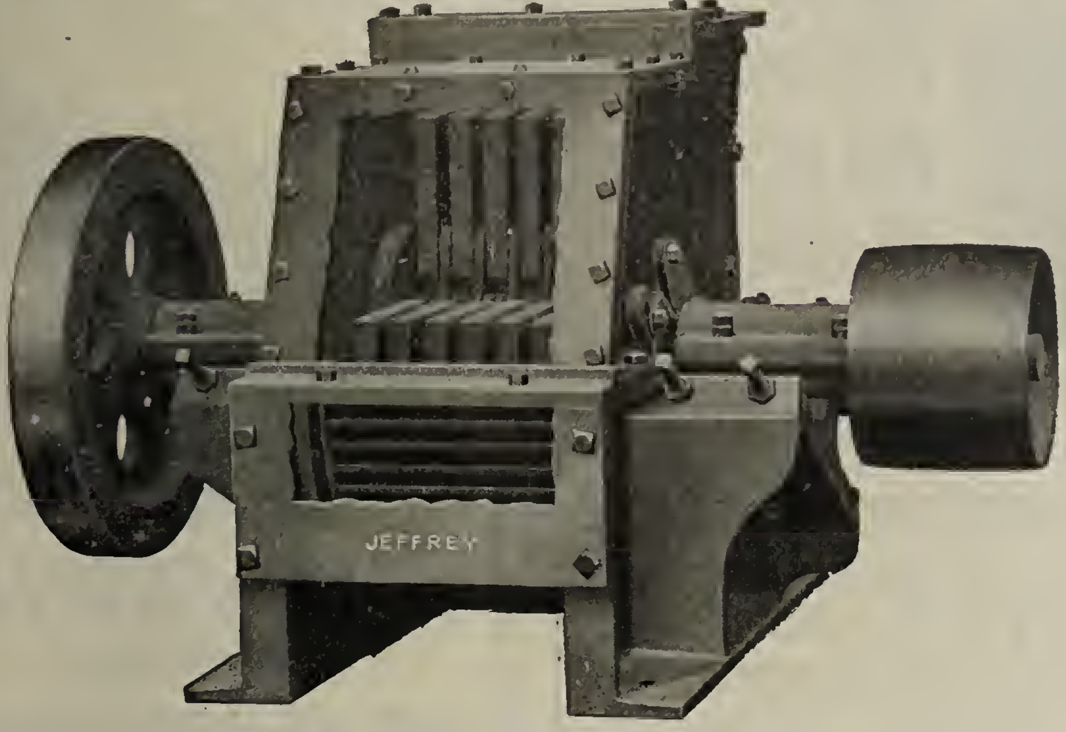

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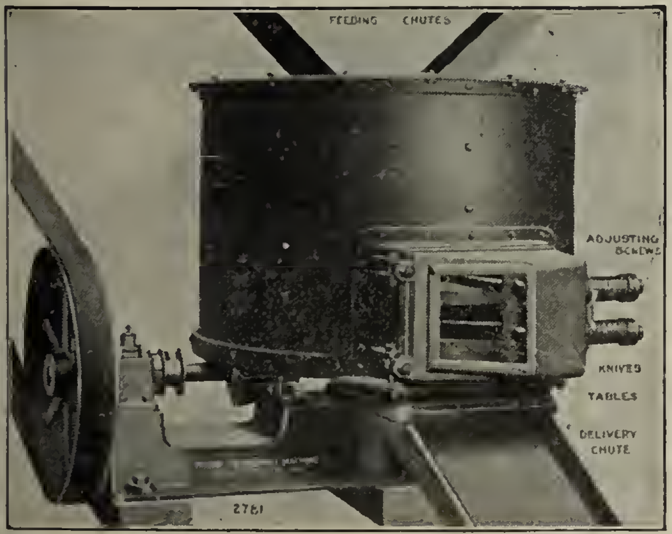

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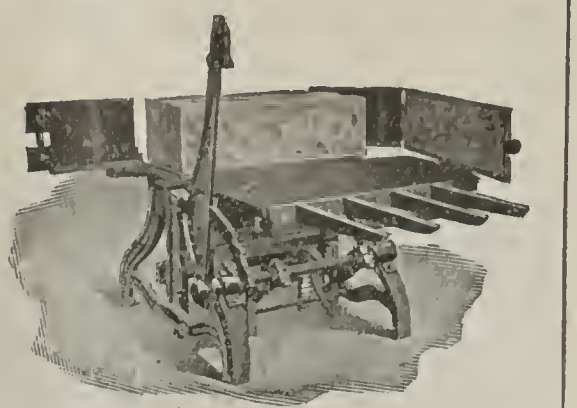

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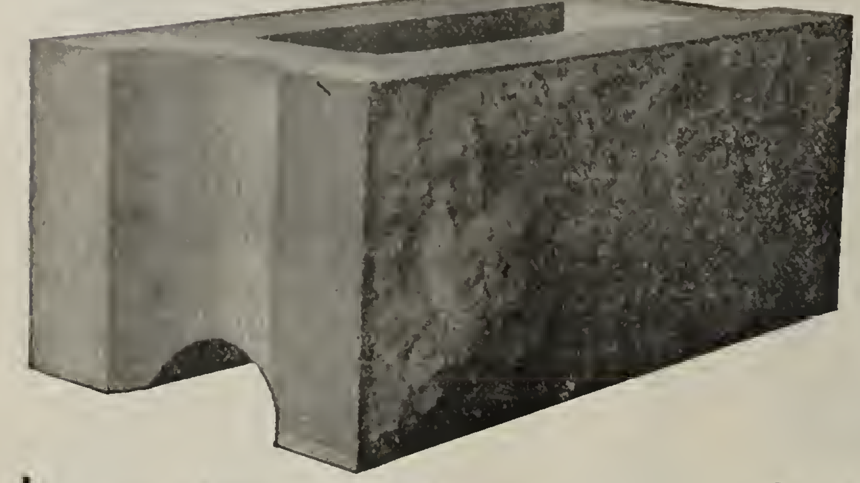

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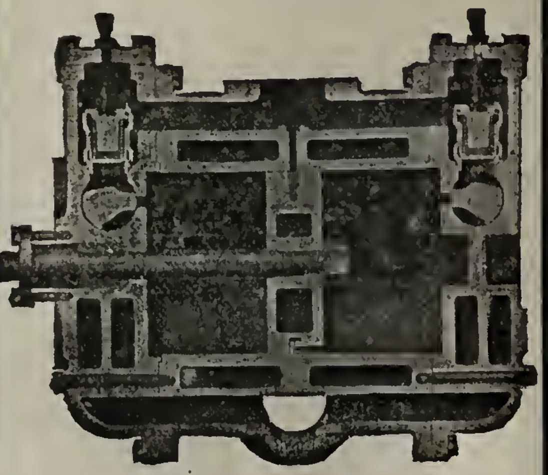

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permit us to reduce both the weight and the space occupied, also securing noiseless operation and increased efficiency.

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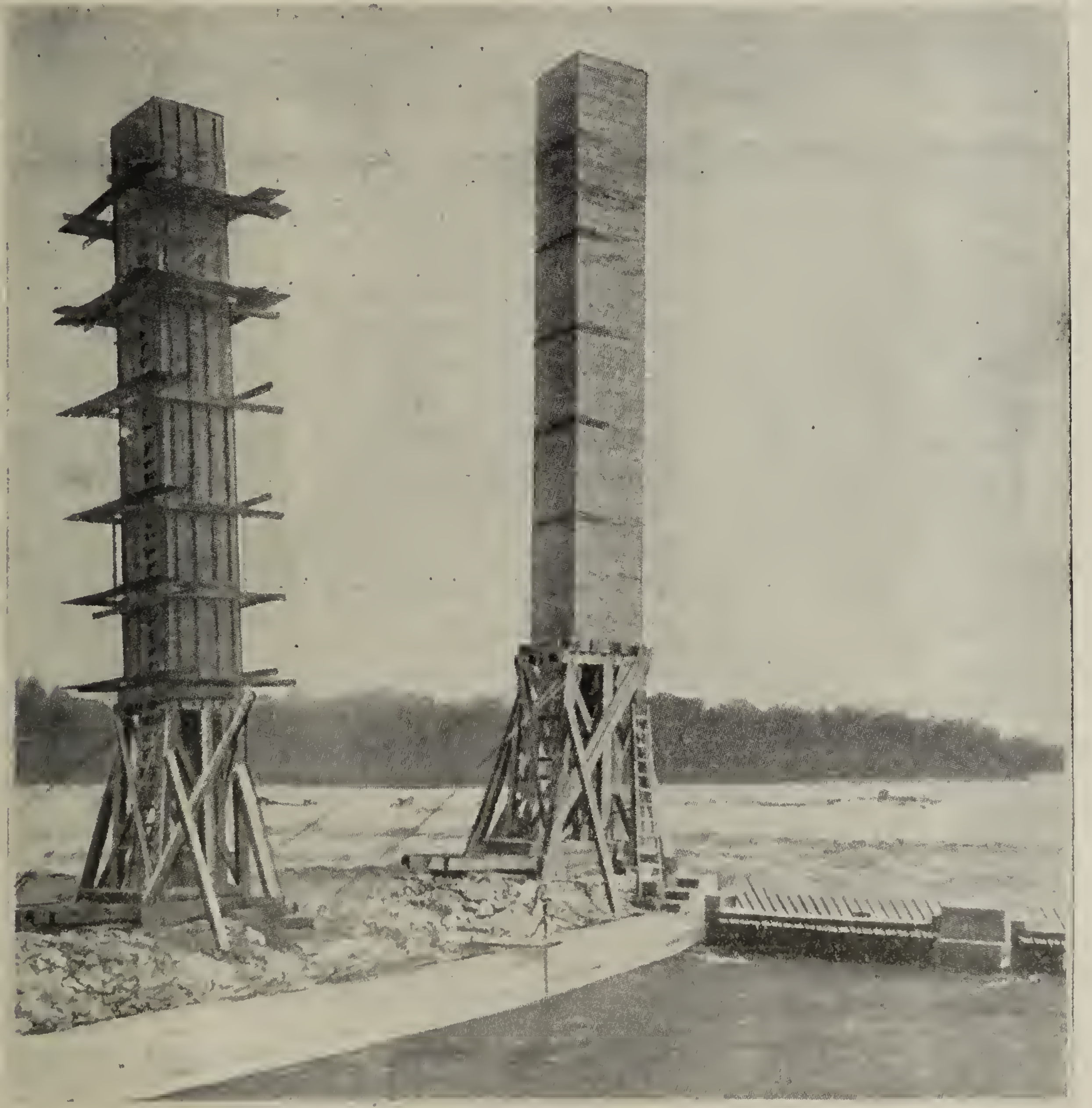

A Concrete Column Constructed

on land to be deposited in the Niagara River at the Horseshoe Falls on the Canada side, for the purpose of forming a wing dam, to cause a rise in the stream to produce an additional head of water at the intakes for the Power House of the Niagara Falls Park & River Ry. The column was 50 ft. high by 7 ft. 4 in. square, constructed on a 20 ft. wooden trestle. After the column was deposited, the water at the intake rose 10½ inches, affording the desired relief.

CEMENT AND ENGINEERING NEWS
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WILLIAM SEAFERT, Editor and Publisher
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CHICAGO, NOVEMBER, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

NATIONAL ASSOCIATION OF CEMENT USERS' CONVENTION.

The National Association of Cement Users will hold its second annual convention on January 9th to 12th at the Armory Building, Milwaukee, Wis. Ample space will be provided for exhibits of machinery and appliance used in the production of concrete and cement ware. All of the latest labor saving devices in this line will be operated for the benefit of the members and general public, and here critical comparison can be made of the practical value of one machine or device with the other. In this respect the convention will be educational to each and every member in attendance, as well as prove a fruitful harvest for the machine manufacturers.

New blood is being infused into the industry. Brick and stone masons, carpenters and other artisans are dropping their tools to engage in concrete construction. It is this particular class of men who will derive substantial benefits in attending the Milwaukee convention. Numerous valuable papers will be read and discussed. Covering the best practice in the use of cement, the discussions will bring out the sense of the convention through its individual members.

The free exchange of ideas in all matters relating to concrete work with the end in view of producing strictly first-class work with the greatest possible economy is one of the prime objects of the convention. Members will desire to know the cause of certain faults that now and then happen in their work in order that they may overcome and correct these faults. Many of the best concrete experts in the country will be present and take part in the proceedings of the convention.

We are fully satisfied each and every member attending will carry away many useful hints and ,positive information that can be applied in next season's work that will more than compensate the expense of attending the convention.

If this is not accomplished the convention will have failed in its mission. The papers to be read and discussed are in themselves an assurance that the goods will be delivered, as will be seen by the following schedules of subjects to be presented:

"Observations on the Testing and Use of Portland and Natural Cements," by E. S. Larned, C. E., Boston, Mass.

"The Tests of Concrete at St. Louis," by President R. L. Humphrey, Philadelphia, Pa.

"The Fireproofing Qualities of Concrete," by E. T. Cairns, chairman of the Committee on Cement for Building Construction of the National Fire Protection Association, Chicago, Ill.

"Air Tamping of Concrete Blocks and Conveying of Blocks," by J. P. Sherer, Milwaukee, Wis.

"Cement Block Architecture," by Louis H. Gibson, Indianapolis, Ind.

"Building Regulations Concerning Concrete," by Will J. Scoutt, Chicago,. Ill.

"Waterproofing," by J. L. Mothershead, Jr., Indianapolis, Ind.

"Causes of Failures in the Concrete Block Business," by O. U. Miracle, Minneapolis, Minn.

"The Use of Cement and Concrete for Farm Purposes," by S. M. Woodward, U. S. Department of Agriculture, Washington, D. C.

"Reinforced Concrete," by C. A. P. Turner, Minneapolis, Minn.

"Concrete Mixers, Tampers and Other Machinery," by E. P. Kelly, New York city.

"Manufactured Stone," by J. C. McClenahan, New York city.

Other papers are expected.

It becomes the duty of every person directly interested in the use of cement to attend the Milwaukee convention in order that they may be up-to-date in all matters relating to the practical side of concrete construction.

Our injunction is, Brother, meet us at the National Association of Cement users, January 9th to 12th, at Milwaukee and you will not regret it.

The mission of the National Association of Cement Users is to extend and enlarge the use of cement along proper lines that will be satisfactory to the producer and consumer. Let us all be there.

THE NORTHWESTERN CEMENT PRODUCTS ASSOCIATION will hold its second annual convention at Minneapolis, Minn., on January 17, 18 and 19, 1906. All cement users in the Northwest should make it a point to attend and take an active part in the proceedings. Numerous papers will be read and discussed. The large attendance at the last convention is a guaranty that there will be a large attendance at the coming meeting.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	SEPTEMBER				NINE MONTHS ENDING SEPTEMBER			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	40,374	$ 337	1,000	$ 57	6,405,230	$ 22.186	6,863,200	$ 21,708
Belgium...........	15,041.573	49,057	30,194,147	102,134	107,979,793	332,655	105,478,295	335,050
France............	305,537	1,294	1,189,900	4,332	10.839,892	36,342	5,513,800	19,653
Germany..........	20,139,885	64,528	8,853,995	25,680	148,626.367	499,493	105,686,079	350,543
All Other Europe.	684,883	1,689	....	....	2,713,035	8,311	240,659	609
British North Am.	49,840	274	2,050	19	191,400	992	129,710	1,387
Other Countries..	610,600	2,322	315	2	2,831,412	9,845	469,615	1,783
TOTAL......	36,863,642	$119,501	40,241,407	$132.224	279,587,129	$909,824	224.380.358	$730,733
Domestic Exports of Cement, bbls.	77,131	120,827	86,796	132,502	427,910	637,579	801,381	1,086,014

There were 17,381,554 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Sept. 1904, valued at $55,563 against 6,863,872 lbs. in Sept. 1905, valued at $20,995.

For 9 months ending in Sept. 1904, there were 84,444 tons of asphalten imported in the United States, valued at $342,189. against 77,159 tons imported in 9 months ending Sept. 1905, valued at $326,440.

UTILIZATION OF SELENITIC CLAYS FOR HYDRAULIC CEMENT MANUFACTURE.

By Fred. W. Brown, E. M.

Hydraulic cements have been given three distinctive groups, viz., Portland, Rosendale and Puzzuolana. These have been clearly defined by all authors and students on the subject and are familiar to everyone at all informed on the matter.

I beg leave, however, to offer for discussion or comment what seems to me to be a fourth and well-defined group. I refer to a class of cement which can be produced in perfection only by a combination of lime, silica and gypsum or selenite, or minerals with a sulphate of lime base. From this cement, as with Portland cement, small amounts of allumina, iron, manganese, chrome or other oxidizing or coloring oxides are not barred, however.

It has long been known that in the manufacture of Portland cement, some materials could be improved by addition of small parts—usually not exceeding two per cent—of fluorspar or of gypsum. It has been universally conceded, however, that in excess of this amount, detrimental results would follow. For if the kiln be at all reducing, sulphides would be formed, and if perfectly oxidizing, the sulphate of lime would be in excess in the clinker. It is a fact that sulphate of lime can be added to Portland cement in this manner with beneficial results, and it is a fact that normal clinker devoid of sulphate of lime, finely ground, must set almost immediately, but the aspects of the case presented by other possible effects on sulphate of lime in the furnace seem to have escaped consideration.

It has been claimed that Portland cement could be made by use of clay and sulphate of lime, instead of carbonate of lime, with evolution of sulphuric acid instead of carbonic acid. This may be theoretically plausible, but it is not commercially possible, because it is founded on a false assumption.

To understand the action of gypsum in the production of hydraulic cement, where it becomes a large or distinctive factor, and to appreciate the legitimate limits of its use, two of its very important properties must be explained and its basic distinction from carbonate of lime must be shown.

When the latter decomposes it leaves CaO and CO_2 is expelled. CO_2 has no reducing action, but it cannot oxidize other bodies because CO is strongly reducing itself. Therefore CaO_2 or other higher oxides are not formed readily in its presence Neither is CO_2 capable of oxidation to CO_3 under ordinary conditions. When the former, i. e., sulphate of lime, decomposes, however, as it does at a high temperature in the presence of silica and a deficiency of lime to supply the affinity of the silica, it leaves CaO_2 and SO_2 is driven off. SO_2 is oxidizable to SO_3, and SO_3 may oxidize other bodies, leaving SO_2, which is not a reducing agent, as is CO, the residue of CO_2. Therefore CaO_2 and other highly oxidized bodies may be obtained readily in the presence of SO_2.

A second important property of gypsum is its power of effecting the solubility of silica. Under normal conditions of nature, acting slowly, it effects the solubility of silica and produces the densest and hardest rocks. Acting in Portland cement it enhances the strength and virtue of the cement, but acting in the furnace at high temperatures it renders large percentages of silica soluble, as well as enhancing the formation of soluble silicates and their affinities.

On these two powers is based, and from them is derivèd, a new class of hydraulic cements which may be aptly termed Selenitic hydraulic cements.

The most distinguishing characteristic of such cement is that it is economically and commercially possible to produce it without reference to the presence of any other oxidizing agent than the gypsum itself—such as iron oxide, etc., though these are permissible as accidents or may be employed for coloring purposes.

The chemical procedure in formation of such a cement is the elimination of the carbonic acid of the lime carbonate—the combination of this lime with silica to form a soluble slag in the presence of the gypsum—the elimination of the SO_2 of the gypsum at a very much higher temperature than the other reactions require, leaving CaO_2 to combine with the slag to produce a crystalline body soluble in water, and crystallizable into a hydraulic cement.

A feature of great importance in this classification or distinction is that CaO in a reducing or normal condition acts most readily to produce slag or $CaO.SiO_2 + 2CaO.SiO_2$, while the lime of the $CaSO_4$ or gypsum would not be available for this purpose unless reduced to CaO. This is not practicable because other reduction would occur of a nature to ruin the cement. Hence lime carbonate is essential for forming the 2CaO, SiO_2. But oxidizing action is essential to the production of high-grade cement, and by use of gypsum to furnish the remaining lime necessary to high strength and solubility, or a part of it, this oxidized condition is obtained in the most convenient and effective form, whereas in the use of all carbonate such additional lime has to be oxidized by the energy of the furnace, or it will revert to free lime and cause expansion of the cement.

It is further to be noted that this class of cement properly manufactured has many merits exceeding those of Portland cement. Some of which are as follows:

Higher tensile strength.

Greater sand carrying power.

Greater ease and economy in manufacture.

Absence of free lime, unless badly overlimed—the excess being sulphate of lime—which is permissible in much higher amounts than with Portland cement.

Ready production of white cements or other highly colored cements with small amounts of metallic oxides in the raw material and regulation of the burning.

The utilization of selenitic shales for cement manufacture, large bodies of which are natural cement deposits.

Cement so produced has a peculiarly valuable composition, being a comingling of soluble silica and silicates, allumina and alluminates; lime and sulphate of lime and their compounds, which like Portland cement can by study and experience be brought to a high degree of specialization and perfection.

NOVEL CONCRETE DAM CONSTRUCTION.

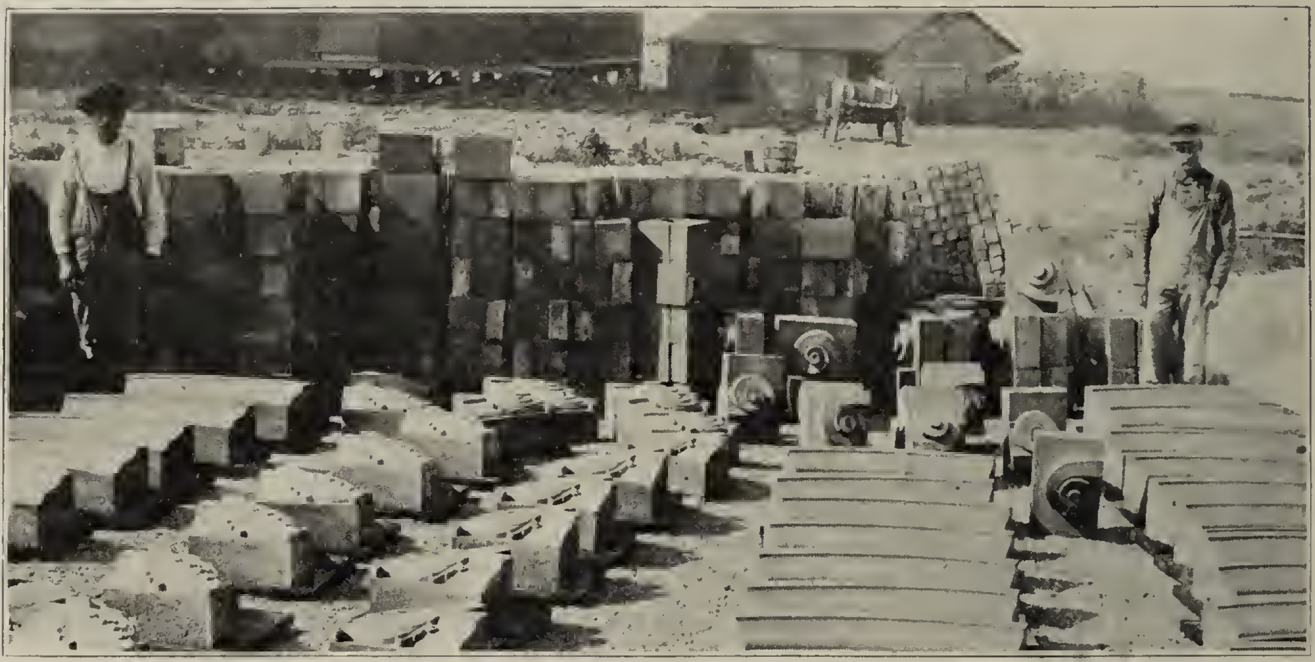
A new method of wing dam construction has been successfully carried out at Niagara Falls.

The problem to be solved was to raise the water at the Horse Shoe falls, on the Canadian side. The flow of water would not permit the construction of a dam in place. The Victoria Park Commissioners jointly with the Niagara Falls Park and River Railway and the city of Niagara, consulted Mr. Isham Randolph, chief engineer of the Chicago Drainage Canal, who devised the plan of constructing a concrete column on land overlooking the site of the dam. To accomplish this a wooden trestle 20 feet high was erected, upon which a column of concrete 50 feet high was built 7 ft. 4 in. square. An 800-pound chain imbedded the center of the column from top to bottom to keep the pieces together after it has been deposited in place. Five wooden wedges, covered with tar paper, were built into one side of the column, to permit the breaking up into comparative regular sized pieces, which would still be held together by the chain. The concrete was mixed 1, 3, 5.

On November 9th the column was forced into the stream by applying jack screws on the land side. The column falling as calculated with the base 15½ feet from the shore breaking into six pieces, causing the water to rise over 10 inches, which was the end in view in constructing the wing dam, as the water supply for the electric railway company, as well as the city of Niagara, were suffering from a shortage of water, all of which the dam has corrected. For illustration on another page shows the column in the false work, and again ready to be turned over into the stream.

SPECIAL BLOCKS CAST IN PLASTER MOULDS.

It is often necessary to produce moulded blocks that cannot conveniently be formed in concrete block machines. Especially where the architect's plans call for special shapes, irregular forms and ornamental designs. These can be moulded in plaster Paris forms, a cast being first taken from the design modeled in clay by an expert modeler. There are numerous Italian workmen producing plaster Paris statuary who can form these ornamental designs and furnish the plaster Paris moulds.



Ornamental Concrete Blocks Moulded in Plaster Paris Forms.

Our illustration shows block and ornamental piece formed in plaster moulds and arched window caps for the great power house at Lockport, Ill., which is being constructed for the Chicago Drainage Canal trustees. The body of these blocks are crushed stone concrete faced with Densiton waterproofing cement. The two men shown in the cut are the expert concrete artisans who manufacture the blocks shown. It requires about 7½ minutes for two men to produce one circular window block in the plaster mould. The waterproof cement mortar is mixed, one part waterproof cement to 2 parts of white Ottawa. White facing sand is first deposited in the mould to form the face. The backing is crushed limestone concrete, mixed 1 part Atlas cement to 7 parts crushed stone, mixed wet. Over 80,000 waterproof faced blocks have been completed for the body of the building made by the American Hydraulic Stone Company on the two-piece block system, made on this company's machine.

The ornamental pieces and arched window pieces can be handled twenty-four hours after being formed.

WHITE CEMENT.

(Translation from Tonindustrie Zeitung, Oct. 31, 1905.)

No matter how valuable the properties of the various Portland cements may be, they all possess one quality which excludes their use for certain purposes, namely, the color peculiar to them. In speaking of the color of the cement, we overlook discolorations caused by efflorescence of certain salts during the hardening process which give the mortar an unsightly appearance. These discolorations are due to improper selection or faulty treatment of the raw materials and can easily be avoided in a well-conducted process of cement manufacture.

Yet as a rule all hydraulic cements are of uneven color, which in Roman cements is cream colored, gray white or of a rusty brown. A trifle better and less irregular is the color of Portland cements which is generally of a light or dark gray. Certain slag cements are, in the beginning of the hardening process, almost white, but gradually turn grayish blue. There are quite a number of objects which could be made of cement if their color would not have to be pure and uniform. For instance, if we could succeed in manufacturing a perfectly white cement, which in addition possessed all the valuable qualities of the hydraulic cements, we would, in the manufacture of artificial marble, have no longer to resort to the unreliable magnesia cement or to gypsum which is not weatherproof. Also, the imitation of such natural conglomerates, the ground mass of which is of a white color, becomes impossible on account of the dark color of the cements. Such artificial stones on this account, obtain a faint color which does not at all equal the natural stone. The production of a pure, white cement would solve the problem of producing all other colors in cement wares. At present, the dark shades of cement call for large quantities of coloring matter in order to overcome the gray and light brown shades of ordinary cements which could in a great measure, be avoided with a white cement as a base.

The difficulties to be encountered in the production of a white cement lie in the selection of suitable raw materials. These must possess all the qualities required of raw materials used in the manufacture of ordinary cements. They must in addition be free from all ingredients which would stain the product in the burning process. Such substances are iron and in a lesser degree manganese, limestone is often to be found answering the required specifications; yet most of the marls, argillaceous limestones and clays used in the manufacture of cement contain iron in considerable quantities. Clays free of iron, however, as those kaolins suitable for the manufacture of porcelain are very expensive and on account of their high clinkering temperature, act upon lime in the burning process with considerably greater difficulty than the easier fluxing clays which contain iron.

Notwithstanding these difficulties, numerous experiments have frequently been made with the view of obtaining white cements. Yet, strange to say, in these efforts it happened as in many other technical problems. Experts tried to accomplish the most difficult at first, and paid their attention almost entirely to the manufacture of a white Portland cement. A number of patents have been granted to inventors of white Portland cement, yet nevertheless this cement has been manufactured so far only in small quantities.

Julius Gresly, manager of the cement works at Liesberg, Switzerland, has, in his efforts to produce a white cement, from the beginning not sought to produce a white Portland cement, but confined himself to artificial Roman cement. By so doing, he considerably facilitated his work, as Roman cements are burnt below the clinkering temperatures. As an example, he took the best French-Roman cements of the following average composition:

Silica	23%
Alumina plus Iron Oxide	13%
Lime and Magnesia	59%
Sulphuric Acid	3%

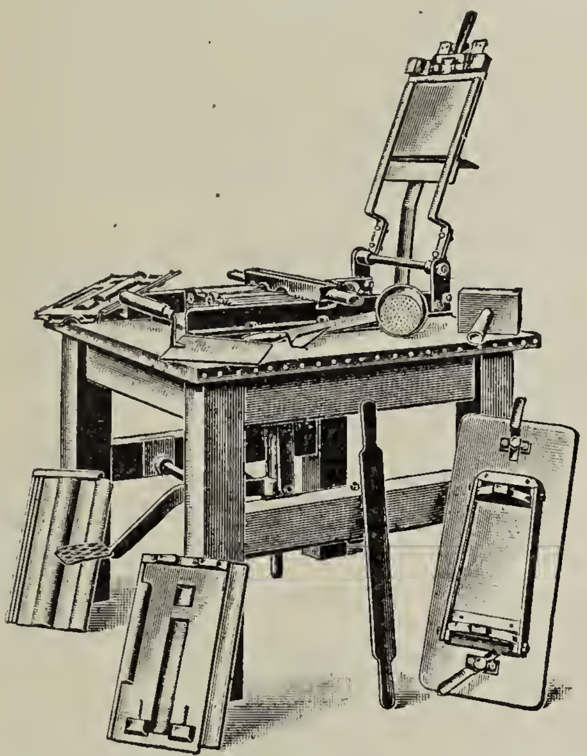
The proportion of silica plus alumina plus sulphuric acid to lime plus magnesia is 39:59. By replacing the iron oxide by alumina, a Roman cement of the above mentioned composition was burnt from substances free of iron, like kaolin, marble and gypsum. The admixture of gypsum is not absolutely necessary. The raw mixture was burnt below the clinkering point at a temperature of about 1,200 degrees centigrade. The burnt material represented .a pure white product which did not slake on addition of water, but which in a pulverized state, showed excellent hydraulic properties. The only difficulties were encountered in the burning as the kaolin and lime acted upon each other only with great difficulty. Yet a slight addition of gypsum greatly facilitated the burning process. The name of this cement is "Liesberg White Cement." It is used in all such cases, where in addition to the other properties of hydraulic cements, a pure white color is desired or mixed with colors, thus assuring bright tones. The cement sets quickly and can be placed in water immediately after having set. Therefore, work to be done with Liesberg cement, has to be done in a very short time; yet this seems to be its only drawback. Moreover, it may be mentioned that this cement possesses sufficient strength, even when mixed with a high percentage of coloring material, and that by its use delicate tints can be obtained. In mixing colors with the cement, it must be taken into consideration that the shade will be slightly lighter after the cement has set; therefore, a little more color has to be added than apparently necessary. Special care has to be taken in the application of ultra-marine which has high coloring power. In preparing these colored cement mortars, the color and cement are thoroughly mixed in a dry state before sand and water are added.

The Liesberg cement will certainly be widely used in the artificial sand stone industry, as it is easy to reproduce, in a surprising way, the most delicate tints of the red sandstones. On account of the quicksetting properties of this cement, the largest concrete blocks can be removed from the moulds after one or two hours and the moulds be used again. The newly made concrete blocks can easily be planed and sawed, but in course of time, become as hard and weather proof as the best natural sand stones. The hardening process can be greatly accelerated by pouring water on the blocks twice or three times a day during the first weeks.

Very good results have been obtained with cast stones made from white cement. The mortar fills out the mould very well, hardens quickly and is perfectly weather proof after a few days. Any defects in concrete blocks can easily be remedied by patching, which hardens just as fast as the ground mass and adheres to it perfectly. In order to obtain perfectly white pieces of marble-like appearance, a mixture of cement and glass sand is recommended. Other kinds of stones are imitated by adding to the casting, pulverized natural stone of the species to be copied. As white cement hardens more slowly than gypsum, large blocks can be cast by a single person. Also variegated castings can be obtained without difficulty.

CEMENT ROOF TILE MACHINE.

There are numerous special machines for the production of cement ware products on the German market, which have not come into extensive use in this country. Our illustration shows a German hand power roof tile machine, which is one of the class of special machines above mentioned. It consists of a frame or table upon which rests a die or form for moulding an interlocking cement roof tile, a hinged lever press. With the machine come numerous pressed sheet metal forms of the exact shape and contour of the lower die mould. These sheet metal forms are placed one at a time into the lower die to receive the Portland Cement mortar, of which the tile is to be formed, a striking off stick which at the same time forms a rough profile of the upper side of the tile. A form or die is then placed over the tile, the hinged lever press is next folded over the form and screwed down. The concrete is then consolidated by beating the top of the mould with wooden mallet. The lever is then unscrewed and thrown back, as shown in the illustration; the upper die is removed and the tile lifted out on the sheet metal form, which serves as a pallet, and carried away to set and harden. A new sheet metal form is again placed into the stationary die, and the operation is again repeated as above described.



The entire operation is simple and rapid, producing good, clean and well-formed tile.

There are several large factories who make the sheet metal forms for the trade, a complete equipment for manufacturing cement tile coles for from four to six hundred sheet metal forms, as the same forms can be used in 24 hours, the tile having obtained sufficient hardness in this time to be removed from the forms. Millions of cement tile are manufactured in Germany yearly, successfully competing in price and quality with the clay roofing tile. The machine described is manufactured by the Geb. Commichi of Magdeburg, Germany.

A simpler method of producing cement roofing tile as well as floor tile has come into use, plaster Paris moulds being used instead of sheet metal forms. The plaster mould is cast from forms in any quantity desired to render the plaster mould nonporous. They are coated with shellack. The plaster moulded product is said to equal the machine made cement tile. The plaster moulds are sometimes made in sections, which are held in place to prevent slipping by pins or pegs on one section of the form and corresponding holes on the other section of the form.

The original pattern mould must be true and exact, otherwise the faults in the master mould will be repeated in all of the casts taken from the master mould.

Therefore a good mechanic alone can produce the master mould.

Plaster moulds reinforced as in reinforced concrete are now being used to form ornamental concrete work.

These plaster moulds are fully as durable as wooden moulds when properly shellaced. Will outlast wooden moulds where extra heavy work is to be moulded and tamped. Projecting handles should be provided to facilitate handling in setting up and taking down the moulds. Hemp or Manilla rope fiber imbedded in the body of the mould gives additional strength. This fiber can be improved by soaking the fiber in a strong solution of lime water; this will prevent the fiber from swelling in the body of the mould. Plaster moulds can only be used in forming work that will draw without breaking. Undercut work must be formed in gelatine moulds.

EARTH'S RAINFALL.

A large portion of the earth's surface is deficient in rainfall, having less than 20 inches a year. It has been estimated that there is sufficient water to irrigate only about one-fifth of the arid region of the United States, or from 150,000,000 to 200,000,000 acres. Of this irrigible area about 10,000,000 acres have been reclaimed. In Europe irrigation prevails chiefly in the south, where it was introduced by the Romans. It is most extensively and systematically practiced in Lombardy, Spain and the south of France.

PORTLAND CEMENT PLANTS IN MICHIGAN IN 1904.

(Continued from last month.)

WHITE PORTLAND CEMENT CO.

This plant is located at Four Mile Lake, a point about three miles east of the village of Chelsea, on a tract of land containing 700 acres and including the lake from which the station takes its name. Connecting directly with the Michigan Central Railroad they have over four miles of trackage for both the storage and shipping of cars, thus giving them every facility for the transportation of their product. Their marl and clay beds, of which they have an inexhaustible supply, are reached through the drainage of the above lake and quantities of both materials are hauled to the storage bins by means of a small 13 ton locomotive and 20 dump cars. Here the deposits remain until such time as required for the direct manufacture. From these bins the material is elevated and run through disintegrators where it is shredded and passed on into the mixers. From here it is lowered into brick machines and cut into small cakes preparatory to drying. Fifty-three boards containing 10 cakes each, are placed upon small iron cars, after which they are taken into dry kilns where they remain 24 hours. The cakes are now ready for the burning kilns and are taken one car at a time by a freight elevator to the various floors at which point the kiln is being filled. Both the cakes or mixture and the coke go in the kiln together, and each are burned at the same time. This process of burning is the old fashioned German method. the same as that by which Dykerhoff and other old country high grade cements are made. The clinker into which form the cakes pass after being burned are next taken out at the base of the kiln and transferred into a huge crusher, thence through ball and tube mills after which it is ready to be sacked at the packing house and ready for market.

WOLVERINE PORTLAND CEMENT CO.

One of the largest and most important cement industries of the state is the Wolverine Portland Cement Co. This company owns two very fine plants, one located at Coldwater, the other at Quincy, both in Branch County.

The Coldwater plant is located about two and one-half miles west of Coldwater on the main line of the Lake Shore Railroad. This immense cement plant was established in 1898 and is supplied with the very latest improved machinery, making it one of the best equipped mills of the kind in the state. Immediately adjoining the plant, they own several hundred acres of marl and clay land which constitutes the raw material for their product, enough to last them for the next 25 or 30 years. This plant runs on an average of 10 months in the year, employing about 135 men. During the past year it has manufactured 50,000 barrels of cement more than in any former year and disposing of 25 per cent of their entire product in the state of Michigan.

The Quincy plant is located about one and one-half miles west of Quincy and was constructed one year later than the Coldwater plant. This is a very modern plant, costing one-half million dollars, and has embodied in it all the benefits that experience has taught in the former plant. Immediately adjoining this plant lay several hundred acres of marl land, which is owned by the company, said marl being taken from the beds of the lake and brought down to the plant by means of immense scows. The plant has increased its capacity over that of 1903 by 100,000 barrels and estimate that there is material in sight for the next 20 years. There are 280 people employed in the two plants at least 10 months in the year, making over $180,000 paid out annually for wages alone. During the past year these two plants have turned out one-half million barrels of cement. Some idea of the volume of business done by this company can be seen when it is understood they would consume over 100,000 tons of coal requiring 3,000 cars to deliver it, and also about 4,000 cars to carry their products to the different parts of the country. This company is in a prosperous condition with headquarters at Coldwater, Michigan, under the general management of Major L. M. Wing.

LETTER BY MR. CHAS. F. WADE, MANAGER OF THE OMEGA PORTLAND CEMENT CO.

The season now about finished has been a very unsatisfactory one to all manufacturers of cement, irrespective of material they are using, system of handling it, or territory in which their mill is located, on account of the low prices, which have prevailed since early spring, and very few, if any, will show any wide margin of profit, and we venture the opinion that none, either east or west, have shown a profit commensurate with the investment or to which they are entitled in order to make the business attractive to the average investor. Two advantages only occur to us as a benefit to the manufacturer in general by reason of this season of low price, and these are, first, and most important, the discouraging of any new projects contemplated in the way of building new factories, and second, it has forced all manufacturers to search for wastes in the operation of their plants, eliminate them promptly, and if possible get down to the very lowest notch of operating cost.

The reason for a portion of the decline in price of cement in our opinion was, first, presidential year, which, while not as extremely evident in reduction of volume of business this year as in former years, still had its effect to a considerable extent in restraining large corporations, as railroads, etc., in their actual expenditures for construction work. Second, the serious labor troubles, which prevailed throughout the country, and more especially in the east during the early spring and summer months, retarding and holding back a large amount of contemplated work, much of which has never been since started, and all of which tended toward the accumulation of cement with the manufacturers, which accumulation prevailed until quite late in the season.

We are looking for a good business during the next season, but believe that low prices will prevail for a goodly portion of the season, or until the winter's accumulation of cement is absorbed, and it would certainly look as though this condition is likely to prevail each year, as we have certainly reached a point where the production is about equal and keeping pace with the demand, in fact an accumulation each winter which will have its effect on the market for the early season's months. We are aware that in answer some would ask "How about the increased demand each year from new uses, etc." We beg to remind them that every mill now operating is each year increasing its output, either from new construction and additions or from new inventions and additional knowledge gained by experience, getting out more cement from the same mill.

The past season has been a hard one for many, and really a suggestion that the time will soon be upon us when it will be a "survival of the fittest" in the cement business, and this means something besides a new and modern mill, and raw materials. We mean by this that only those with economical, low fixed charges, experienced, skilled help, and all economies at all times prevailing to bring about results, and that the cement business is no different from any other line. but requires brains and skill to bring about results in close competition.

PORTLAND CEMENT PLANTS IN MICHIGAN.

Cement plants in Michigan, name, location and capacity:

		Brls.
1. Aetna Portland Cement Co., Fenton		1,000
2. Alpena Portland Cement Co., Alpena		1,000
3. Bronson, Kalamazo Portland Cement Co., Bronson		1,000
4. Egyptian Portland Cement Co., Fenton		1,200
5. Elk Cement & Lime Co., Elk Rapids		600
6. The Farwell Portland Cement Co., Farwell		...
7. Great Northern Portland Cement Co., Marlborough		900
8. Newaygo Portland Cement Co., Newaygo		1,300
9. Omega Portland Cement Co., Mosherville		600
10. Peninsular Portland Cement Co., Cement City		700
11. Peerless Portland Cement Co., Union City		1,800
12. Toledo Portland Cement Co., Manchester		1,000
13. White Portland Cement Co., Chelsea		500
14. Wolverine Portland Cement Co., Coldwater		1,500
15. Wolverine No. 2 Portland Cement Co., Quincy		1,500
16. Wyandotte Portland Cement Co., Wyandotte		450
Number of plants in the state		16
Number in operation		14
One plant will commence operation in 1905.		
Aggregate cost of plants in operation	$7,550,781	
Average cost of each plant	513,385	
Number that use marl as a basis for cement		11
Number that use limestone as a basis		3
Average per cent of clay used in the manufacture of Michigan cement		22
Number plants that obtain their clay in Michigan		11
Number plants where clay is shipped from another state		3
Aggregate daily capacity of 15 plants in barrels		15,050
Average capacity for each plant		1,000
Number plants where cost of manufacture will diminish		11
Number plants where cost of manufacture will not diminish		3
Number plants where demand for product will increase		14
Number plants where output will increase		12
Number plants where output will remain stationary		2
Number of barrels manufactured in 1903—13 plants		1,420,000
Estimated number barrels for 1904—12 plants		2,638,000
Per cent of cement manufactured sold in Michigan		50
Number of years plants can run with material in sight		75
Aggregate number employes on pay rolls—14 plants		1,500
Average number for each plant		107
Average daily wages paid each employe	$2.20	
Average per cent that are classed as skilled		25
Average daily wages paid those classed skilled	3.93	
Number plants employing traveling salesmen		10
Number traveling salesmen employed		19
Average annual salaries paid traveling salesmen	$ 1,237	
Average amount annual pay rolls—12 plants	943,200	
Average amount monthly pay rolls—12 plants	78,600	
Average amount daily pay rolls—12 plants	3,023	
Average amount for each plant, yearly	78,600	
Average amount for each plant, monthly	6,550	
Average amount for each plant, daily	252	

THE RELATION OF THE SPECIFIC GRAVITY OF RAW CEMENT MATERIAL TO THE OUTPUT OF A ROTARY KILN.

By W. H. Hess.

[A contribution from the laboratory of the Indian Portland Cement Co., Neodesha, Kansas.]

It has been demonstrated in factory practice that rotary kilns of the same size and exactly alike in shape, pitch, speed of rotation, and having the same stack dimensions, and with the same thickness of fire brick linings, give nearly twice the output in clinker when working on cement rock, or limestone and clay, that they produce when using a mixture of dry marl and clay. The chemical composition of the raw cement materials before calcination is approximately the same in both instances and the resulting cement has the same chemical and physical properties. While the chemical composition of the marl and clay mixture is practically the same as a cement mixture prepared from limestone and clay, or from cement rock, there is a wide and distinguishing difference among such mixtures in specific gravity; so that the chemist may judge of the relative value of limestones, chalks, marls, cement rock, or natural cement mixtures, clays, shales, etc., by taking the specific gravity of material prepared by drying and grinding to 100 mesh, and mixing in the proper proportions to give the required chemical composition for Portland cement and comparing data thus acquired with results obtained from testing materials of known efficiency.

By the term "marl" in the above paragraph, I refer to the lake deposits of Michigan, Indiana, Canada, etc., which are composed of about 90 per cent of precipitated chalk, about 5 per cent of shell lime and 4 to 6 per cent of organic matter.

DETERMINATION OF THE SPECIFIC GRAVITY.

Mixtures were prepared from dried samples of marl and clay, chalk and clay, limestone and clay, using the same clay in each instance, and grinding to pass an hundred mesh sieve. These mixtures were made so that the resulting cement would have the same chemical composition. For the determination, a small weighing bottle of about 25 cc. capacity was used. It was dried and weighed out, then filled with distilled water at a temperature of 15° C. and weighed again. The 100 mech dry powder was then fed into the dried bottle, tapping the bottle carefully on the table to displace all air, and thus packing the bottle full but no further compression was used and when the bottle was full and somewhat rounded over the mouth, the surface was carefully struck off with a steel spatula, care being taken to avoid any packing of the material. Results obtained by the writer gave for marl alone a weight of 48 lbs. per cubic foot; for C. P. precipitated chalk, 32 lbs. per cubic foot; for natural chalk of commerce, 70 lbs. per cubic foot.

It is evident that considerable variations in results would be obtained by varying the size and shape of the vessel used for the determination, the method of tapping, etc.; but if the chemist will adhere to like conditions throughout a series of tests, comparative results will be obtained.

EXPERIMENTAL PART.

A series of experimental burnings of cement were made to see if there would be any decided difference in the output of a small rotary kiln working with different material, and if so to ascertain the conditions to which such changes in output might be due, and thus develop conclusions from experimental data which might be of value in determining the commercial value of raw cement materials by simple chemical and physical tests.

For this purpose a small rotary was built 14 inches in diameter and 6 feet long and lined with a 4-inch firebrick lining, leaving a central opening of 6 inches. It was mounted on trunnions with adjustment for varying the slope and was driven by an electric motor, the speed of which could be changed as desired. A brick housing was placed at the discharge end, and the escaping kiln gases were carried away by a brick chimney, with 4 by 8-inch flue. The kiln was fed through an opening at the back of the chimney, the feeding being by hand with a small fire shovel and sufficiently frequent to spread the material evenly the length of the kiln. Gasoline was used as fuel and was burned under 60 lbs. pressure through a large burner specially made in the machine shop and designed after the Hoskins patent hydrocarbon burner. A ten-gallon riveted steel cylindrical tank designed to stand 200 lbs. per square inch was used as a container for the gasoline. It was connected to the burner with a quarter-inch pipe. Pressure was supplied to the gasoline by connecting the tank with an air compressor working under 60 lbs. pressure. The container was placed on a set of platform scales so the quantity of fuel consumed could be gauged and recorded. The burner was placed so that the flame passed through a circular two-inch hole through the housing of the kiln striking in the center of the kiln flue. With the apparatus about 90 minutes was sufficient to heat the kiln and get good clinker.

Mixtures were prepared of limestone and clay, and Michigan marl and clay, using the same clay for each, and great care was taken to keep the ratio of lime to clay alike in both cases. The analyses of these mixtures were as follows:

	Limestone and Clay. Per cent.	Marl and Clay. Per cent.
Carbonate of Lime	74.80	72.20
Carbonate of Magnesia	3.50	3.18
Silica	14.06	13.96
Alumina	5.11	4.72
Iron Oxidi	2.43	2.16
Organic Matter, Water, etc.	0.40	3.78

Mixtures were also prepared from cement rock, and from chalk and clay, of as nearly the above chemical composition as possible. In each case the mixtures were ground to pass a 100-mesh sieve, then mixed with water to a slurry to insure a thorough amalgamation, and were then dried and reground to 100-mesh powder.

These materials were then burned in the small rotary kiln described above. The same quantity of fuel per unit of time was consumed with each different type of material tested and the same pressure of 60 lbs. per square inch was used in each case. The same pitch of rotary and the same rate of rotation was preserved, the only change being in the quantity of material fed per unit of time, this being gauged by the appearance of the cooled clinker the aim being to obtain dark green clinker with a fixed percentage of brown or underburned clinker and to feed all the material the kiln would clinker without producing more than 10 per cent of underburned. If the output of underburned was more than 10 per cent of the feed, the amount fed was decreased, and if the percentage of underburned clinker was less than 10 per cent the feeding was increased, and those changes were kept up until a constant quantity was produced; and the results were then computed into pounds per hour, and are given in the following table:

	Weight per cubic foot of fine ground mixture. Lbs	Weight of raw material consumed. Lbs.	Weight of clinker produced. Lbs
Marl and clay mixture	52	3.8	2.2
Limestone clay mixture	88	5.8	3.5
Cement rock mixture	92	6.2	3.8
Chalk and clay mixture	70	4.8	2.8

From these results it would appear that the higher the specific gravity or the greater the weight of the ground raw cement mixture per cubic foot, the greater is the output of a kiln, and that the quantity of raw cement material measured in cubic feet, that a kiln will heat to the necessary cement forming temperature is nearly a constant, all other conditions being the same.

A kiln, therefore, using a marl and clay mixture consuming 1.125 lbs. of coal per hour and producing 1,600 lbs. cement consumes 2,760 lbs. cement mixture having a volume of 53 cubic feet. A kiln of the same construction working on a cement rock mixture and consuming 1,125 lbs. of coal per hour and producing 3,200 lbs. of cement per hour, consumes 52 cubic feet of raw cement mixture per hour. The more dense the raw material is the less space it will occupy in a kiln, and the greater will be the resulting weight of cement which a kiln will produce.

Drying the wet marls of Michigan, Ohio, Indiana, Canada, etc., will not suffice to make them economical materials. Marl is too bulky for a rotary kiln to handle economically; chalk is also too light, and both these materials must in time cease to be a factor in the cement industry. They will gradually lose out in point of economy, and their places will be filled by limestone or cement rock, and even the lighter types of limestone will give way to the heavier class. The higher the specific gravity the better, from an economical point of view.

FIRST CONCRETE BUILDING IN NEW YORK CITY.

We illustrate the first entire concrete building erected in the City of New York. The building is constructed of Normandin blocks and is located at New Dorp, Staten Island, and was built by J. W. Hughes, 45 Broadway, N. Y. The fireplace and stairways are concrete construction, Normandin system.

PACIFIC PORTLAND CEMENT CO.

In our October issue we mentioned the sale by the receiver of the assets of the Pacific Portland Cement Co. There being two companies of the same name on the Pacific coast, one the Pacific Portland Cement Co. of Suisun, Solano county, California, and the Pacific Portland Cement Co. of Stevens county, state of Washington, which was sold out.

The California company is entirely solvent and is doing a large business while the Washington plant never entered the market with its product.

More than 250 new companies and individuals have taken up concrete construction during the past thirty days. A sample copy of our journal will be delivered to each of the companies and individuals above indicated.

INDIAN PORTLAND CEMENT CO.

Neodesha, Nov. 4.—The directors and principal stockholders of the Indian Portland Cement Company are here to-day to inspect and formally accept the newly completed plant. Among those here are: Robt. Nesch of Kansas City, the man who first commenced negotiations to put in the plant; J. A. Cruikshank of Bellefontaine, Ohio, the man who took over Mr. Nesch's options and pushed the thing through to a successful termination; B. W. Hocker, of Kansas City; J. Riecker, Rev. J. Stinlage and Dr. Louis Aleff, all of Piqua, Ohio; J. C. Josse, of Rushsylvania, Ohio; Dwight Harrison, of Columbus, Ohio; and T. J. Cookson, of Cincinnati. Mr. Cookson is the inventor and producer of the famous steam heater and purifier known by that name.

The Lehigh Portland Cement Co. is investigating the cement materials near Dixon, Ill.

BOOK NOTICES.

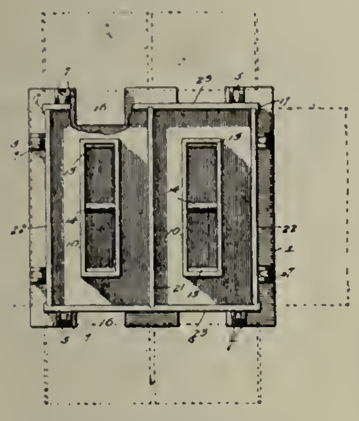
"A Treatise on Concrete, Plain and Reinforced," by Frederick W. Taylor, M. E., and Sanford E. Thompson, S. B., Ass. Member Am. Soc. of Civil Engineers. With Chapters by R. Feret, S. B. Newberry and Wm. B. Fuller. 585 pages, 6x8 in. 176 illustrations. Price, $5.00. John Wiley & Sons, New York.

This book is full of valuable data, covering the materials of construction and design of concrete, plain and reinforced. The entire literature on the subjects treated has been studied, condensed and arranged under appropriate heading and incorporated in the text, where any special information on concrete construction may be consulted. The footnotes indicates the authority upon which the text is based, thus enabling the investigator to consult the more extended information on the subject.

The treatise is in a great measure a compilation bristling with valuable data which must be appreciated by the engineer, architect and contractor interested in concrete construction.

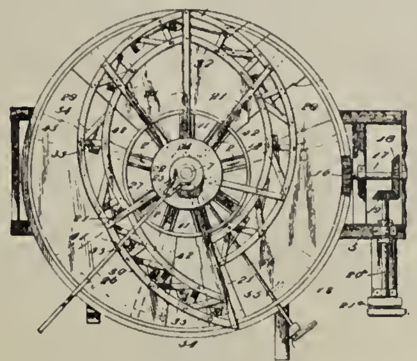
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

801,249. Concrete-Block Mold. Edward Keagy, Newark, Ohio. Filed March 10, 1904. Renewed May 25, 1905. Serial No. 262,269.



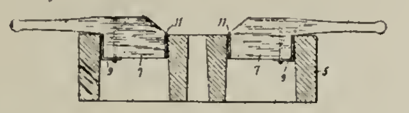
4. A mold comprising a base-plate, mold sides extending upward therefrom and connected therewith, certain of said sides being hinged to the base, a core removably mounted between the mold sides, a removable top plate, and a detachable hopper having an interlocking engagement with the top edges of said sides to retain them in operation through the tamping operation, the said top plate and hopper being interchangeably applicable to the mold-body, substantially as described.

801,329. Concrete-Mixer. Hugh Miscampbell, Duluth, Minn. Filed Oct. 23, 1902. Serial No. 128,457.



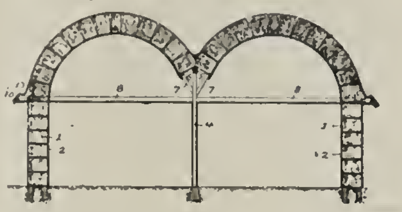
Claim.—1. In a concret-mixer, the combination of a base, a revoluble floor mounted thereon, a non-revoluble frame positioned above said floor, depending stirring-plows provided with beams pivotally secured to said frame at their forward ends, and limiting-loops secured to said frame and loosely engaging said beams intermediate of their ends, substantially as described.

801,342. Means for Lifting Building-Blocks. Albert A. Schultz, Appleton, Wis., assignor to John Driscoll and Michael K. Gochnauer, Appleton, Wis. Filed Dec. 9, 1904. Serial No. 236,176.



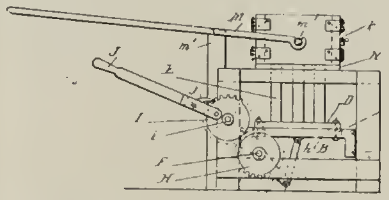
Claim.—1. A means for lifting a building-block or the like having an opening therein, comprising an engaging block smaller than the opening and adapted to be enterd therein and a handle on the engaging block by which the engaging block may be tilted to bind against the walls of the opening.

801,361. Composite Building Structure. John B. Clayton, Kirkwood, and Reno D. O. Johnson, St. Louis, Mo. Filed Nov. 14, 1903. Serial No. 181,142.



Claim.—1. In a composite building structure, a cellular concrete wall, comprising inner and outer facing-webs in parallel and separated relation, integral transverse connecting-webs in angular and intersecting relation to each other to provide cells in close and isolated relation, and fillings of compressed straw or the like inclosed in said cells, substantially as set forth.

801,561. Block-Molding Machine. Nathan W. Warren, Austin, Minn. Filed March 8, 1905. Serial No. 249,031.



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High Aluminous Blocks for Discharge End of Rotaries.

Best Brick for Nose Tail and Feed End.

Brick for Driers—Hoods—Stacks—Boiler Settings.

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MAGNESITE BRICK
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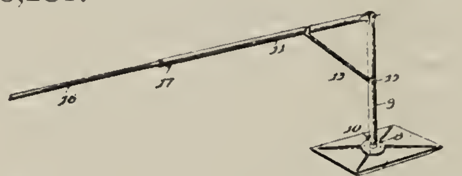
CHROME BRICK

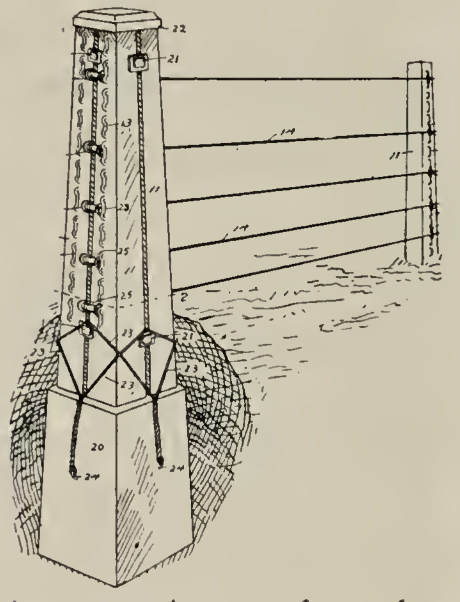
Claim.—1. The combination, with a supporting-frame, of a molding-box provided with pivot-pins and resting on the said frame, said molding-box being reversible and being provided with a perforated bottom, a forked lifting-lever pivotally supported by the said frame and engaging with the said pins, core-blocks slidable in the said perforated bottom, and means for sliding the said core-blocks.

801,611. Tool for Smoothing Granioid. John C. Schottler, St. Louis, Mo. Filed Jan. 9, 1905. Serial No. 240,281.



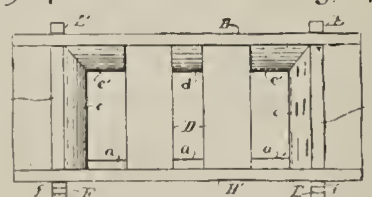
Claim.—1. A tool for smoothing ganitoid comprising a suitable smoothing-tool; a pintle extending upwardly from the center of the tool; a tubular post adapted to receive the pintle in its lower end; a tubular handle extending at right angles from the upper end of the tubular post; a brace connecting the tubular handle to the post; and a second handle slidingly mounted in the tubular handle; substantially as specified.

801,620. Cement Post for Wire Fences. Hermon W. Timmons, Coatesville, Ind. Filed Apr. 7, 1905. Serial No. 254,325.



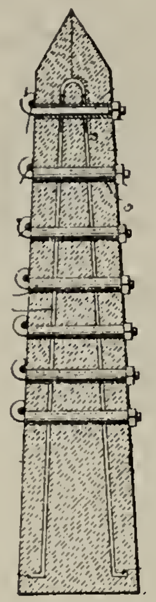
Claim.—1. A post formed of a plurality of similar posts, a base-block hollowed in its upper end to receive the lower ends of said posts, a cap fitting over the upper ends of said posts, and bolts extending between said posts in both directions with heads on them for binding the posts together.

801,761. Mold. Nicholas H. Battjes, Grand Rapids, Mich. Filed Sept. 19, 1904. Serial No. 225,141.



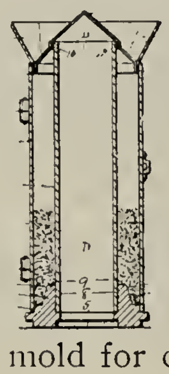
Claim.—In a mold for concrete blocks, separate bottom, side and end plates, supporting-beams under the mold having serrations in the upper surface, stationary posts secured to said beams, movable posts supported on said beams, pawls pivoted in the movable posts in position to engage the serrations on the beams, clamping-levers.

801,845. Molded Fence-Post. Thomas H. Bradley, Lexington, Ky. Filed May 25, 1905. Serial No. 262,241.



Claim.—1. A molded fence-post having a substantially U-shaped metallic core embedded therein with corresponding edges provided with aligned notches, and open-ended tubes fitter sidewise in corresponding notches with their ends flush with opposite faces of the post.

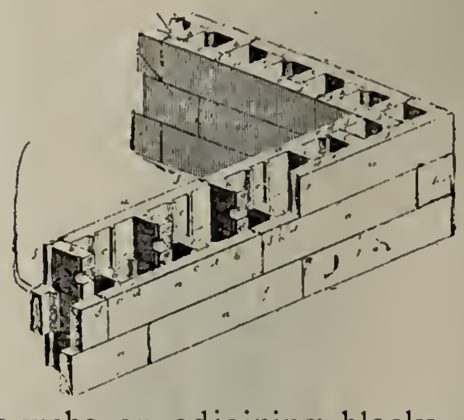
801,915. Mold for Culvert, Sewer, and Other Pipes. John Robinson, Hamilton, Canada. Filed Dec. 22, 1904. Serial No. 237,984.



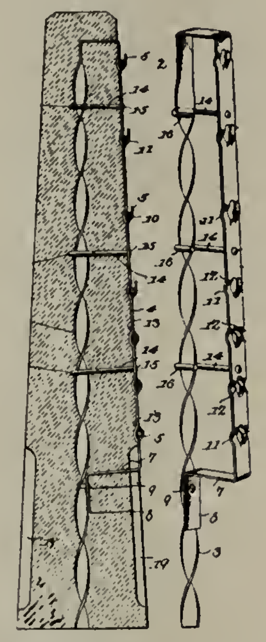
Claim.—A mold for concrete pipes, comprising a cylindrical shell in two parts vertically joined together, hinges on one vertical joint, and a fastening on the opposite vertical joint, a removable open and flared top resting on the shell; an annular flange on the lower part of the flared top loosely inserted in the shell, a central vertical cylindrical core in and extending above the shell, a canopy resting on and covering the top of the core, an annular flange on the lower part of the canopy fitting around the upper end of the core, and brace-straps rigidly secured to the annular flange of the flared top and to the annular flange of the canopy top to centrally locate the upper part of the core in the shell.

801,920. Building Block and Wall. Rudolph J. Schwab, Milwaukee, Wis. Filed Feb. 23, 1905. Serial No. 246,943.

Claim.—1. A building-block formed on one side at one end and near the center with cross-webs and on opposite sides of the central web with recesses to receive the ends of cross-webs on adjoining blocks, substantially as described.

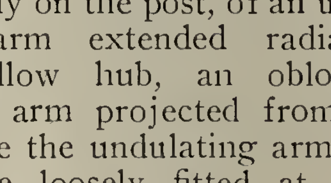


802,143. Fence-Post. James F. Haffey, Tiffin, Ohio. Filed Aug. 17, 1905. Serial No. 274,587.



Claim.—1. As a new article of manufacture, a combined reinforce and strand-wire supporter for concrete fence-posts, embodying a twisted reinforcing member, an approximately flat strand-wire-supporting member having strand-wire-holding elements, and spaced keepers connecting the two elements.

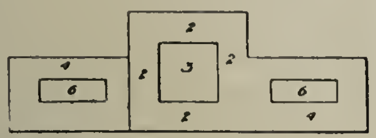
802,199. Mixing-Machine. Jay B. Cross, Oneonta, N. Y. Filed Jan. 25, 1905. Serial No. 242,603.



Claim.—1. The combination with a pan having a circular side wall and a flat bottom wall, a post centrally mounted in the pan on the bottom wall, and a hollow hub mounted rotatably on the post, of an undulating beater-arm extended radially from the hollow hub, an oblong ring-shaped arm projected from the hub opposite the undulating arm, a scraper-blade loosely fitted at its edges against the side wall and bottom of the pan, means for detachably mounting the scraper-blade on one side of the oblong ring-shaped arm, and means for rotating the hub and arms with the scraper-blade in position or when it is removed from its supporting-arm.

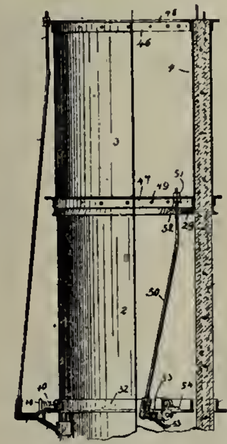
802,593. Building-Block. George L.

Peabody, Pittsburg, Pa. Filed March 14, 1904. Serial No. 197,930.



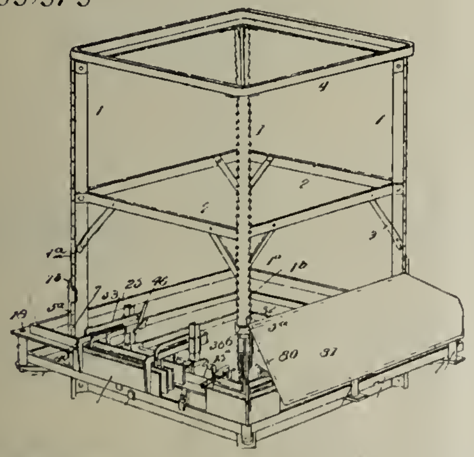
Claim.—1. As an improved article of manufacture, the herein-described building-block of concrete having a rectangular chimney portion provided with a rectangular opening therethrough, and a lateral extension formed by continuing the wall of the block at one side, the other side being formed by an offset and a lateral extension from the chimney portion and of less width than said portion, said extension having an opening therethrough formed by an end wall, with means whereby they may be maintained in angular relation to be swung together thereon, and means for constraining lateral movement of said sections on the box when thus swung, in combination.

802,666. Apparatus for Molding Concrete Structures. Carl Stieler, Chicago, Ill. Filed July 19, 1905. Serial No. 270,359.



Claim.—1. The combination of a pair of shells arranged to form a continuous mold-chamber therebetween, with means for changing the forms of said shells to cause the adjacent walls thereof to approach, or recede from, each other, and means for supporting said shells upon a cast previously formed therebetween, in such a manner that said shells, or their support, do not rest on top of, or obstruct the space immediately above, said cast.

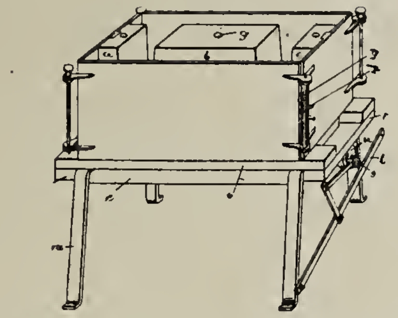
802,699. Molding Apparatus. Charles F. Lancaster, Petoskey, Mich. Filed April 14, 1905. Serial No. 255,575.



Claim.—1. In a molding apparatus for building walls, the combination of a scaffold or support, a mold carried by the scaffold and movable horizontally thereon to be advanced lengthwise of the wall in construction, and means for moving said mold transverse to the line of its movement above mentioned to admit of passage of obstructions in the length of the wall.

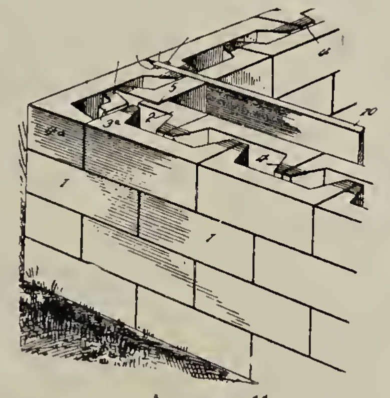
2. In a molding apparatus for building walls, the combination of a scaffold, a platform vertically adjustable upon and at one side of the scaffold, a carriage movable along the platform, and a mold mounted on the carriage.

802,848. Molding-Machine for Making Building-Blocks. William E. Dunn, Chicago, Ill., assignor of one-half to Frederick W. Dunn, Woodstock, Canada. Filed Nov. 12, 1904. Serial No. 232,471.



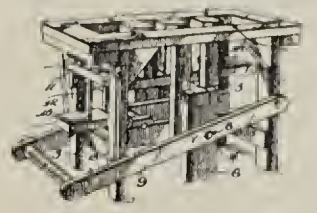
Claim.—1. In a molding-machine for making building-blocks the combination of a base longitudinally apertured, a slotted bar forming part of the apertured base with longitudinally disposed apertures *a* at each side thereof, core members adjustable on the slotted bar, a locking means to hold the core members in their adjusted position on the slotted bar, a pallet consisting of two parallel side bars to embrace the sides of the core members and arched braces connected to the side bars so as to enter the spaces between the core members.

802,903. Building-Block and Wall Construction. Zacharias Anderson, Minneapolis, Minn. Filed Oct. 4, 1904. Serial No. 227,113.



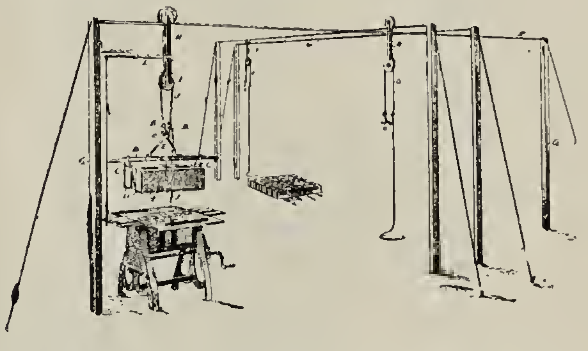
Claim.—1. A wall construction comprising inside and outside blocks having tenon-shaped ribs formed upon their opposing faces, the spaces between the ribs being adapted to receive the corresponding ribs of the opposite blocks without contacting with the sides thereof, the corner-rib of the width from its base to a line intermediate of its base and its extreme inside corner-block increasing in end, and diminishing in width from its base to a line intermediate of its base and its extreme end, and diminishing in width from said line to said end.

803,014. Machine for Producing Artificial Stone. David McIlray, Riceville, Iowa. Filed April 11, 1905. Serial No. 254,924.



Claim.—1. In a machine of the character described the combination with a table having an opening in the top thereof, and guides connected to the table and extending below the top; of a slide mounted within the guides, a base supported thereby and adapted to assume a position in the opening to close the same, a core upon the base, simultaneously-movable levers connected to the slide, locking-strips adapted to automatically engage the levers, and means for simultaneously retracting said strips from engaging with the levers.

803,016. Conveyer for Artificial Stone. Floyd Palmer, Washington, D. C. Filed March 24, 1904. Serial No. 199,828.



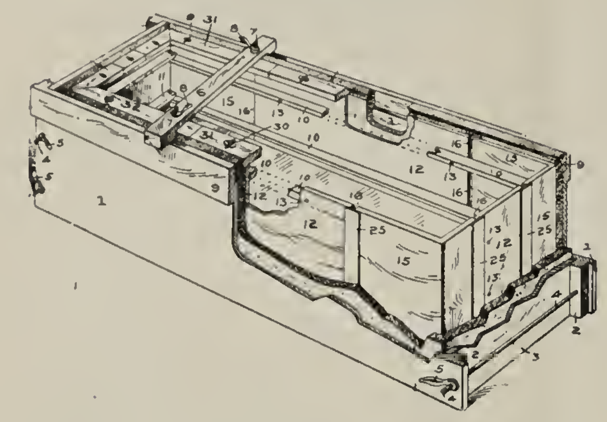
Claim.—1. A conveyer for artificial stone, provided with a carriage, a hand-bar suspended from the carriage, rods depending from the hand-bar, and means on said rods for engaging and supporting a stone-holding plate.

2. A conveyer for artificial stone, provided with a carriage, chains or ropes suspended therefrom, a hand-bar suspended from the chains or ropes, rods depending from the hand-bar, and supporting-arms secured to the rods.

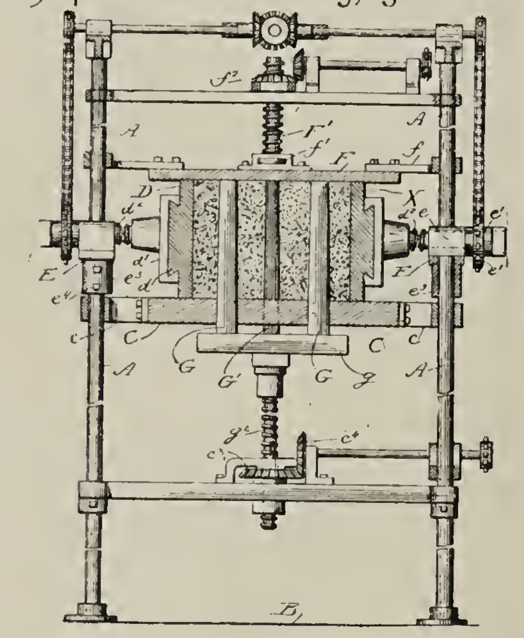
3. In a conveyer for artificial stone, the combination of an elevated track or rail, a carriage, and stone-supporting means suspended from said carriage comprising a hand-bar, rods depending from the hand-bar, and means on said rods for engaging and supporting a stone-holding plate.

803,023. Mold for Forming Cement-Receptacles. Ora Staley, Charlottesville, Ind. Filed Oct. 31, 1904. Serial No. 230,848.

Claim.—In a mold for forming cement-receptacles, an outside mold comprising parallel side pieces having transverse cleats on their inner faces adjacent to their ends and parallel end pieces between said sides bearing against the inner edges of the cleats, means for removably securing said parts to each other, transverse bars supported upon the top edges of the mold thus formed, and an inside mold suspended from said transverse bars and comprising a plurality of members that form rectangular frames, intermediate plates securing the rectangular frames together, slots in the members that comprise the rectangular frames, bolts passing through said slots, nuts on said bolts, and outside angle corner-plates placed loosely against the inner mold thus formed.

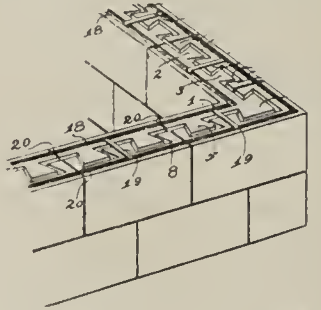


803,092. Machine for Making Artificial Stone. Valentin Bueckermann, Chicago, Ill. Filed Sept. 24, 1904. Serial No. 225,836.



Claim.—A book-press comprising a base, standards rising therefrom, a bottom plate and a top plate both of which have corner extensions which are slidably mounted on the standards, means for operating the plates, a frame supported on the standards and having bearing-blocks, screws threaded through said blocks, brackets carried by the screws, side and end plates mounted in the brackets, and means for actuating the screws to advance and retract the side and end plates.

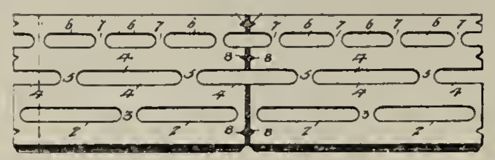
803,290. Building-Block and Wall Construction. Olof Johnson, Estherville, Iowa. Filed March 18, 1905. Serial No. 250,839.



Claim.—1. Building-block embodying lateral or angular end extensions, and corrugated or roughened plates applied to sides of said extensions.

9. A building-wall composed of adjacent blocks, there being vertical recesses at adjacent ends of said blocks, the blocks being provided with kerfs or grooves vertically of the recesses aforesaid, and a joist having an extremity received between the adjacent recessed portions of the blocks and provided with vertical tongues or ribs received in the kerfs or grooves aforesaid.

803,380. Building - Block. John Wickre, Williamsburg, Va. Filed July 1, 1904. Serial No. 214,978.



Claim.—1. A building-block formed with a number of apertures arranged in a plurality of series, the apertures of each series having intervening necks, the necks of any one series being out of alignment with the necks of either of the other series, two of the series being formed with half-length apertures at the ends of the blocks.

JANESVILLE CEMENT POST CO.'S ORDERS.

Sutton Norris is now in charge of the Janesville Cement Post Co.'s plant. Some large orders have recently been filled and prospects are better than ever before. The Chicago & Alton Railroad has ordered posts for thirty miles of fencing. A carload of special order posts was sent this week to the Vermont farm owned by Robert T. Lincoln, son of Old Abe. The car was gaily hung with banners and will advertise the concern all along the route. Another carload has been ordered for the William Jennings Bryan farm in Nebraska.

The return corner block heretofore considered indispensable in concrete building block construction is being displaced by the straight block, finished front and one end. The return corner block consumed more time in the making as well as setting in place, it being extra heavy. The mason did not like it as well as the straight block, which gives an equally good finish and effect in the wall.

PERSPECTIVE.

PERSPECTIVE OF

Hollow Concrete Building Block Residence

We will send you this perspective drawn to one-quarter inch scale, with one-sixteenth inch scale drawings of floor plans in corners on white paper with blue lines, upon receipt of "One Dollar." Perspective is 20 inches by 18 inches. This picture displayed on your walls will help you make sales. Address

Wm. M. Kingsley & Co., Architects, 1010 Rockefeller Bldg., Cleveland, O.

Or CEMENT & ENGINEERING NEWS, 226 La Salle St., CHICAGO, ILL.

George J. Grant
CONTRACTOR.
61 EAST NINTH ST. ST. PAUL, MINN.

October 5, 1905

Marquette Cement Manufacturing Co.
Marquette Building, Chicago

Gentlemen:-

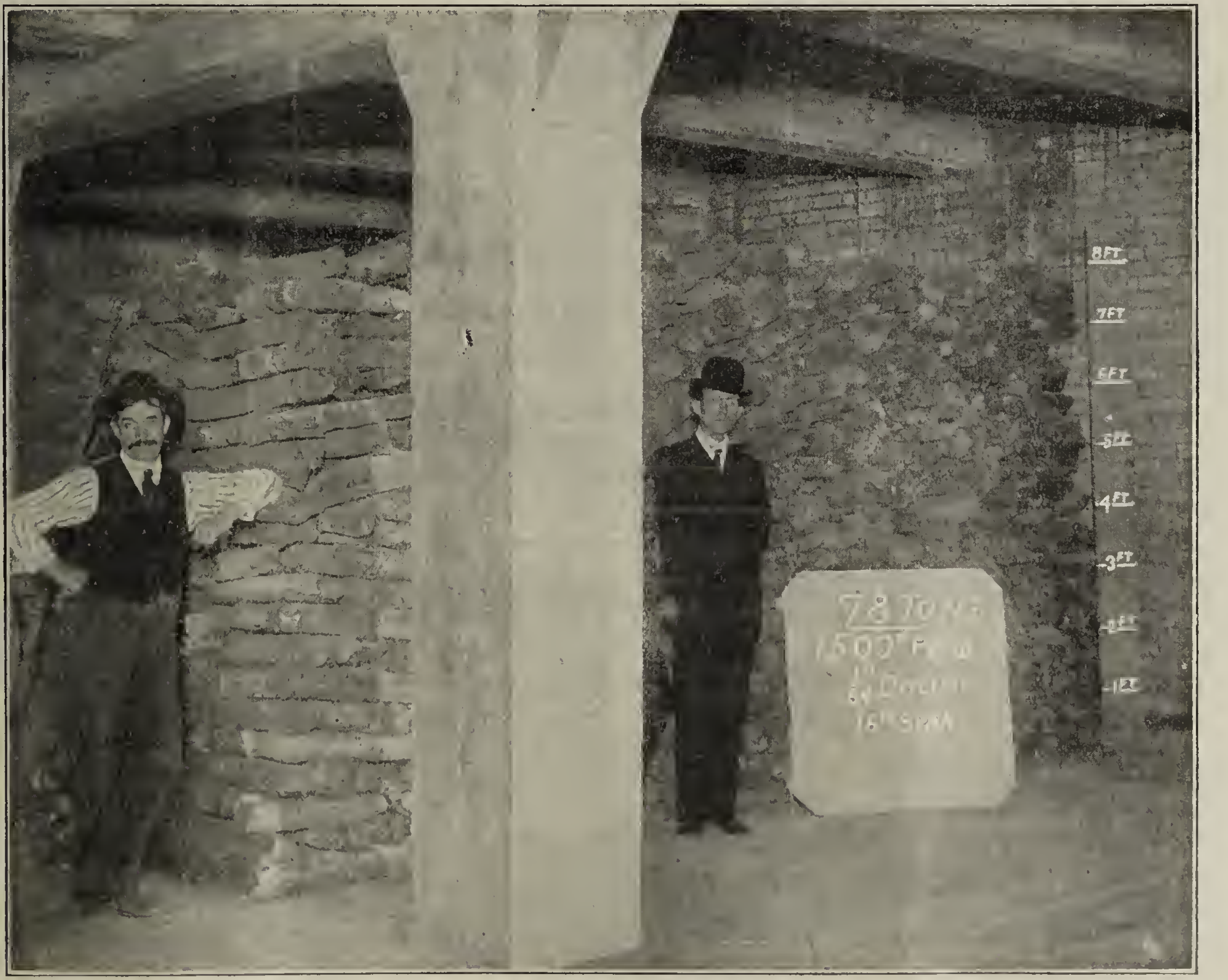
The second test on the floor of the Farwell, Ozmun, Kirk & Co. warehouse in this city was made last month. The size of the panel tested was 13' x 16' upon which we placed 78 tons pig iron on the center of the pannel. The space covered by the pig iron was 6 1/2' x 16' which is equal to 1,500 pounds to the square foot.

The panel when tested was 90 days old and the deflection was 1/64 of one inch.

The panel was constructed with Marquette Portland Cement and I must congratulate you on the quality of cement you are making.

I enclose a photograph of the test.

Yours truly, Geo J Grant



25,000 BARRELS MARQUETTE PORTLAND CEMENT USED IN THIS BUILDING

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,
228 La Salle St., CHICAGO, ILL.

10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
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December

1897
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March July
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1899
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March

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1904
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CEMENT AND ENGINEERING NEWS
162 La Salle Street, CHICAGO, ILL.

Fire Brick Linings
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STANDARD TESTING SAND AND GENERAL BUILDING SUPPLIES

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WANTED AND FOR SALE ADS.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

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WANTED

Position as Chemist after January 1, 1905. Have had five years' experience as Chief Chemist of one of the largest and most up-to-date cement mills in the United States. Best of experience furnished. Address "A. B. C.," care CEMENT AND ENGINEERING NEWS.

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An up-to-date thoroughly practical treatise on the use of concrete, covering all branches of construction

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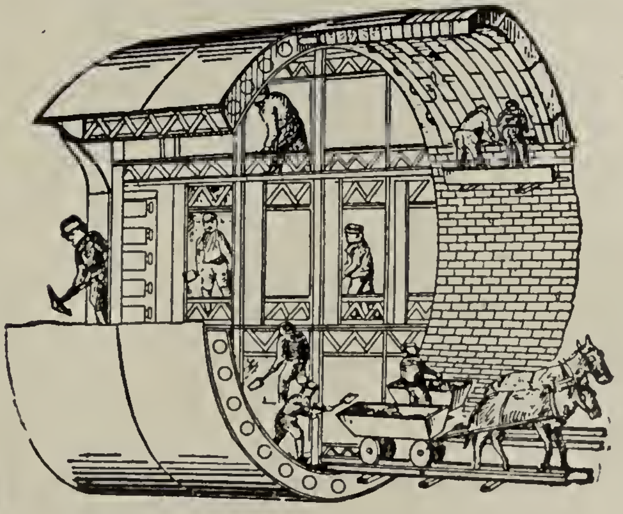

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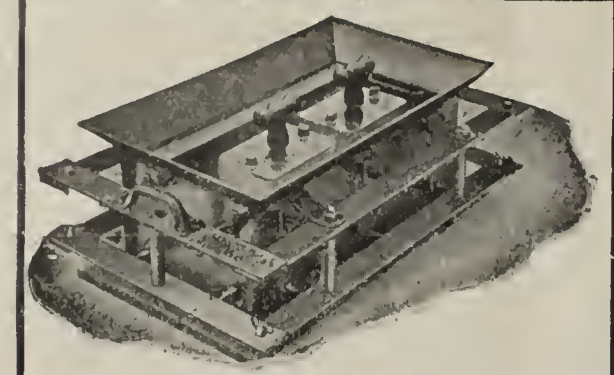

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1 MAN CAN MAKE BLOCKS PER DAY **200**
NO CARRYING OFF BLOCKS. NO IRON PALLETS. NO COGS OR SPRINGS.
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Inspections, Reports and Tests of Cement Materials.
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Bridges, Buildings,
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Abundance of High Grade Materials!
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Are all essentials to bear in mind in determining on the location of Portland Cement Works. These essentials can all be had at several points on the line of the Atchison, Topeka & Santa Fe Railway System.

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STRAKER'S PATENTED
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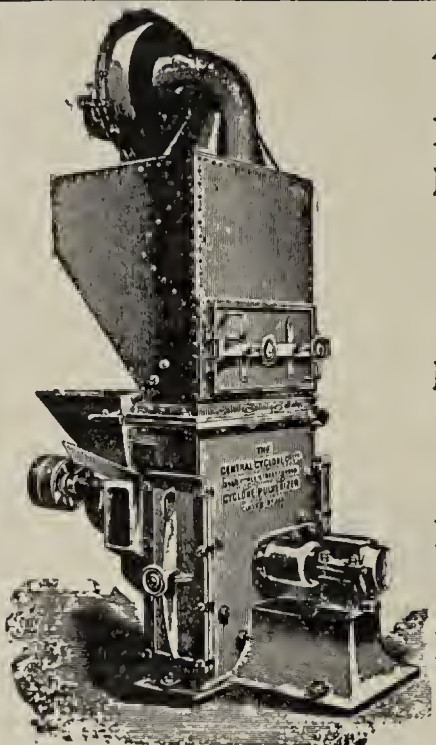
Coal Pulverizer



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DUSTLESS in operation.
PRODUCT is so uniformly fine that ALL or 98%, or 90%, or any other percentage (according as the machine is "set") will, if tested, pass through a sieve of the mesh required.
NO DRYING OF THE COAL is required before grinding unless it contains more than 15% of moisture. The AIR used absorbs and carries off moisture.
RECEIVES COAL in pieces of large size and reduces it quickly to powder.
ANY MESH of powder desired.
USED BY some of the largest Portland Cement Works in the World.

A Larger Output Per H. P. Than Any Other Machinery in the Market.
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MANUFACTURERS for UNITED STATES, CANADA and MEXICO
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The Ideal Hollow
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Not a new machine. Tried and tested over two years. Satisfied users everywhere. Interchangeable to various widths. Adjustable to sixteen lengths. No wheels, cogs, gears, chains or cranks.

Nothing to Clog, Break,
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In the middle Atlantic state, many houses are being built of concrete because that material has been found cheaper than wood. Bids on a Pittsburg house were $4,500 for concrete and $4,800 for wood. In Washington, $5,000 was asked for building a concrete house and $5,800 for a wooden one of the same size and character.—Springfield, Mass., Union.

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"Portland Cement Sidewalk Construction"

Based upon the experience of many successful contractors.

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226 La Salle St., CHICAGO, ILL.

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THE LEHIGH VALLEY RAILROAD runs through the great Portland Cement centre which extends across the counties of Warren and Hunterdon in the State of New Jersey, Lehigh and Northampton in the State of Pennsylvania, and Cayuga and Schuyler Counties in New York. There are also extensive deposits of marl at various points.

Information to your advantage may be obtained from

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The simplicity of operation and perfection of results attained, places it at once **far and away** beyond reach of competition. Send for Illustrated Catalogue explaining everything in detail. Write to-day, it will only cost you 2c to find out all about it. For nearly two hundred years inventors have been trying to discover a means to create a **perfect** bond between the atoms of the stone composition, but no until now has this been accomplished. We cannot explain all about this great invention in a brief advertisement, and therefore ask a careful reading of our literature before you invest a cent in any other process.

We have the absolute endorsement of every practical Engineer who has investigated our methods and the universal verdict is: **"You have solved the problem."**

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BUCKET ELEVATORS
Equipped with the "Indestructable Ley Bushed Chain."

The Link-Belt Machinery Co.
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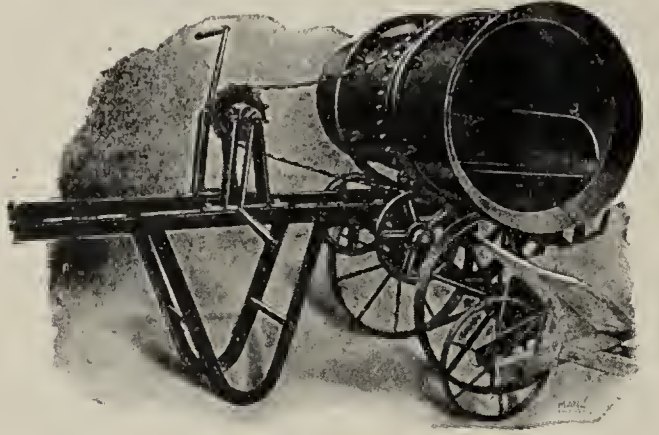

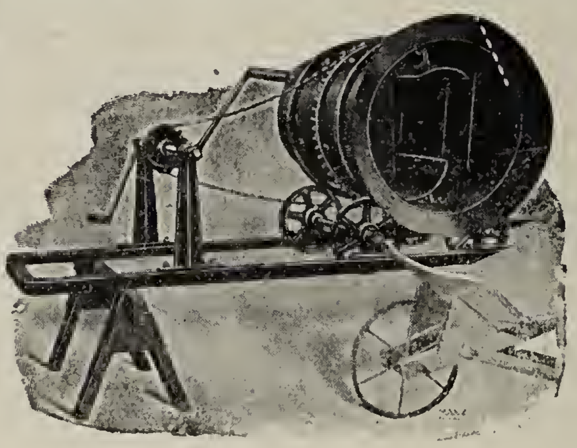

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HAND POWER
CONCRETE MIXERS
FOR
SIDEWALK WORK, CEMENT BLOCKS, ETC.

POWER MIXERS OF ALL SIZES.

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NEW YORK LIFE BUILDING,
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If you earn your living with Cement Tools you **must have good tools**—We **make high grade** tools **only** and sell them **direct** to you at a price that makes you tell your friends about us. Our complete line of Cement Tools is shown in our circular No. 46, which will be sent **free** to anybody.

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Our complete catalog of tools No. 460, showing tools for over **40 trades** will be sent to any address on receipt of 20c to help pay expressage.

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We are taking orders for Tampico Fibre Brushes used in making the brush finished concrete. This finish resembles the finest cut stone work. Brushes delivered by mail at $1.00 each. Address CEMENT AND ENGINEERING NEWS, 226 La Salle St., Chicago.

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REPAIR PARTS

GIBS, TRUNNIONS
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PRESSURE RINGS
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Repair Parts. Write us.

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ARCHITECTS' AND ENGINEERS' HANDBOOK OF
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172 pages. Illustration and Diagrams 217 Pages.
By L. J. MENSCH, C. E.
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Cement and Engineering News,
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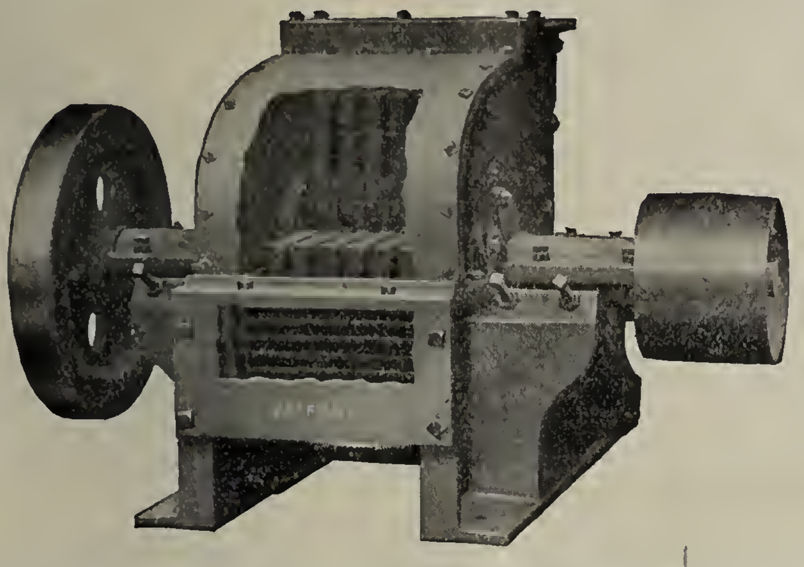

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WORKS KOSMOSDALE KENTUCKY
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GUARANTEED FOR STRENGTH UNIFORMITY AND FINENESS

It is a Portland Cement of the Highest Grade for all Purposes

KOSMOS PORTLAND CEMENT CO.
General Offices:
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The Trump Concrete Machine
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is a self-contained portable outfit that automatically and accurately measures, moistens and mixes the materials with the greatest economy of labor.

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Simplest, Cheapest and Most Expeditious Method of Constructing Hollow Concrete Walls. Descriptive Matter on Application. Address

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Tells you what Cement is, its nature. And proper methods in the making of Mortar and Concrete. Also how to reinforce Concrete with Metal. In a most simple way it describes over 50 subjects of construction. The book is in 5 parts and contains more than 30,000 words. Sent to any address postpaid on receipt of 50 cents. Address

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"How to Use Portland Cement"

[From the German of L. Gollinelli.]

Published by the Association of German Portland Cement Manufacturers, under the name of

"DAS KLEINE CEMENT-BUCH."

Translated by S. B. Newberry,

Twenty-Three Thousand of this publication sold in Germany in three months.

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CEMENT AND ENGINEERING NEWS,
226 La Salle Street, Chicago.

The Hercules Machine Made This Block

HOW CEMENT STONE MAKERS CAN INTEREST ARCHITECTS

Architects have been slow to specify cement stone for the reason they could not get the cement stone maker to make such sizes and designs necessary to suit their plans.

Talking to a prominent architect recently, he said, "I prefer cement stone as a building material, but of the three manufacturers in my city not one can give me the variety of designs and sizes necessary. They content themselves with making stone of a few sizes and designs and don't seem to realize the large volume of business they could get if they would make in addition to Hollow building stone, Trimmings such as water table, sills, lintels, freize and ornamental designs, four, five and six feet long.

The HERCULES MACHINE

is a complete stone plant in itself, it makes a larger variety of designs and sizes than any machine in the world. It makes all sizes of stone from two inches to six feet long.

It makes two stones at one operation which feature alone reduces your labor item to almost one-half.

It tamps on the face allowing 2 to 1 facing and 5 to 1 backing. Thus saving material and producing a more durable and perfect face stone.

Let us send you our catalogue G and tell you all about it. We know its many other features will appeal strongly to you.

It might be the means of you saving Thousands of Dollars yearly. It is saving it for others—why not you—write us to-day.

Century Cement Tools

The Century Cement Machine Co. of Rochester, N. Y., who manufacture the Hercules Cement Stone Machine which is so well known for producing high-grade stone of wide range, have placed upon the market an excellent line of cement tools for cement users, consisting of jointers, edgers, curbing tools, tucking tools, tampers, etc., of all sizes.

These tools are of the very latest designs—finish superb—prices exceedingly low.

Catalogue giving full particulars sent free. Write to-day

CENTURY CEMENT MACHINE CO., No. 182 MAIN STREET, W., ROCHESTER, N. Y.

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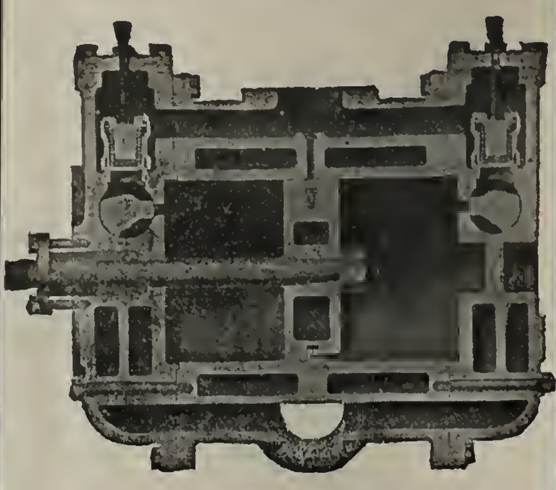

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permit us to reduce both the weight and the space occupied, also securing noiseless operation and increased efficiency.

Full particulars are given in our

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Consulting Engineer for the Cement Industry

Portland Cement Plants Designed, Constructed and Superintended

Properties Investigated and Physical and Chemical Reports Made
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Established Plants Examined and Improved
Output of Kilns Operating on Wet Material Increased

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CEMENT

AND

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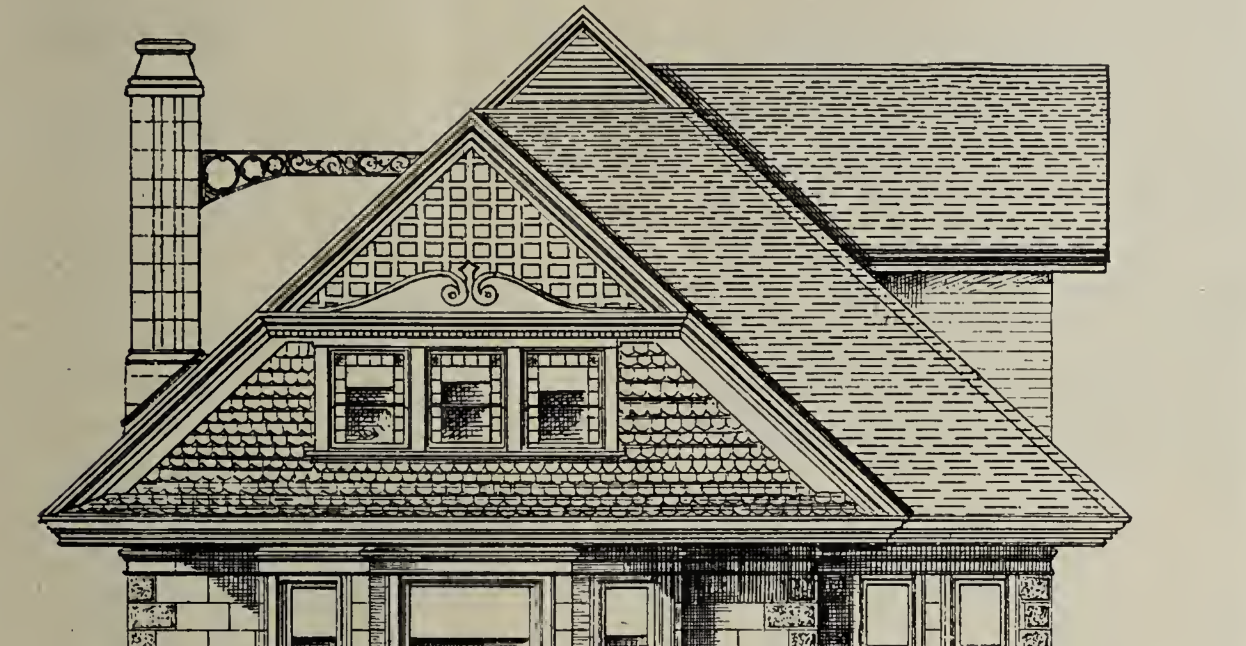
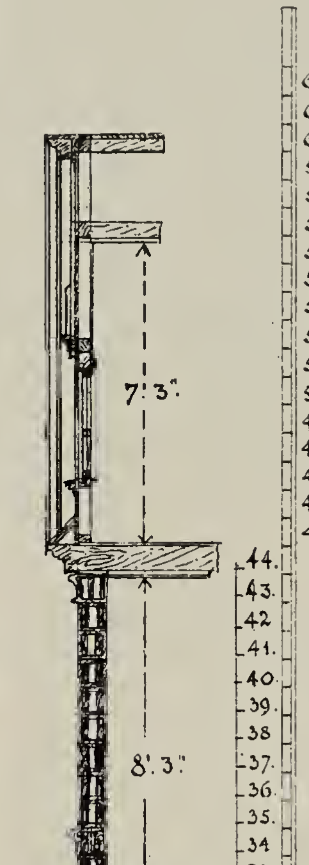

— Fig 1. — —— A Country Residence made of Hollow B'ld'g Blocks ——



— Fig 2 Part Section — Fig 3. —

Concrete Block Construction Carried Out on the Standard Masonry Bond System of Construction.
(See page 232 for Description.)

CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher
OFFICE—226 La Salle Street.
Cable Address—"Seafert," Chicago.

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"This world belongs to the energetic."

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, DECEMBER, 1905.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

CONVENTION NOTICES.

National Association of Cement Users' Convention at Milwaukee, January 9 to 12, 1906.

Northwestern Cement Products' Convention, January 17, 18 and 19, at Minneapolis, Minn.

Iowa Cement Users' Association, February 8 and 9, at Ames, Iowa.

NATIONAL ASSOCIATION OF CEMENT USERS' CONVENTION.

Someone has been guilty of spreading false news as to the place and dates of holding the second annual convention of the National Association of Cement Users, which will tend to bring confusion and annoyance to many of the individual members of the association, as well as the loss of time and money. The association itself selected Milwaukee for its second annual meeting, Jan. 9 to 12, inclusive. Now comes some interloper with an axe to grind, shifts the dates and place of meeting from Milwaukee to Columbus, Ohio, for Jan. 10, 11, 12 and 13. A full week after the change had been decided upon we received an unsigned notice from a firm of printers in New York who are closely affiliated with Robert W. Lesley. The Engineering Record and many other papers published this notice fixing Columbus as the place of meeting. On Dec. 26 we received a printed slip without date or personal signature, stating that the convention would be held at Milwaukee on Jan. 9 to 12, 1906. Many members will undoubtedly go to Columbus and be greeted by empty halls, all due to some past master of the art of confusion. We hope that the matter will be sifted to the bottom and the guilty ones be called to an account. This will be the first duty of the convention, in order to avoid repeating the same tactics in the future.

We hope there will be a large attendance at Milwaukee, as the conventoin will undoubtedly be interesting, notwithstanding the blunders committed in high places. Let there be a full attendance.

NATIONAL CEMENT MANUFACTURERS' ASSOCIATION.

The annual business meeting of the association was held at the Astor House, New York, on December 11, 12 and 13. J. B. Lober presided. Seventy-eight members attended. A dinner on Tuesday evening and a smoker on Wednesday morning enlivened the occasion. John B. Lober was re-elected president, C. E. Bottomley secretary, Mr. Ackerman treasurer.

Reports on trade conditions during the past season were highly satisfactory compared with the previous two seasons.

Changes in handling cotton bags were recommended whereby the price of the bags is to be included in the price of the cement. Cotton bags will be repurchased by the mills, paying 7½ cents per bag at the mill, subject to mill count and inspection.

Minneapolis, Minn., Nov. 4, 1905.

To the Members of the Northwestern Cement Products' Association and Cement Users of the Northwest:

In accordance with the order of the executive board of this association, the second annual convention will be held at Minneapolis on January 17th, 18th and 19th, 1906.

I wish to congratulate you as members of this organization, upon the interest shown in the welfare of this association, and particularly in the upbuilding of this great industry. The rapid strides made in this business have greatly exceeded the fondest hopes entertained by those who first started the movement to perfect this organization a year ago. Our first convention proved a most interesting and instructive meeting, and as all of you know who were in attendance, it was necessary to extend the meeting until the fourth day in order to complete important discussions that were under way, and much benefit was derived, and many valuable lessons learned by all those in attendance.

For the coming session, the program committee promises us a much more interesting and instructive program than that of last season, and from the unparalleled interest shown at the present moment, we have every reason to believe that the coming meeting will be one you cannot afford to miss.

Make plans to come, and come prepared to talk.

Yours very truly,
O. U. Miricle,
Pres.

IOWA CEMENT USERS' CONVENTION

The Iowa Association of Cement Users will hold its second annual convention at Ames, Iowa, Feb. 8 and 9, 1906. An extensive program is being arranged and provisions for exhibition of machinery, cement and cement products at the state college grounds are under way. A large attendance is expected at the coming meeting.

The engineering faculty of the college will take active part in the proceedings of the convention.

The Chicago & Northwestern Railway will make special rates for the convention.

CONCRETE ASSOCIATION OF N. Y.

The Concrete Association of New York has adopted a constitution, with by-laws, in which it appears that the object of the association shall be to encourage and to develop the intelligent and scientific use of cement, concrete and steel reinforcement, concrete machinery, to standardize methods of construction with a view to obtaining best results, to promote social intercourse and to secure an exchange of views upon subjects of interest; to reform abuses relating to the various industries represented by the membership of the association, to obtain and diffuse accurate and reliable information relating to all matters affecting the concrete industry and to establish and maintain a permanent exhibition of its various productions and manufactures.

The executive committee met on Thursday evening of this week and appointed standing committees, particularly the committee on membership, which will proceed to put the association in thorough working order. Two classes of membership have been provided. First, the active membership, which consists of all individuals or firms which have their capital invested directly or indirectly in the cement or concrete industry. Second, the associate membership, which will permit of the admission of professional men, such as architects and engineers and those who have no capital directly invested in the concrete industry but whose work is allied with it or who are particularly interested in the subject. There will also be enrolled in the associate membership firms outside of the immediate jurisdiction of the Concrete Association, it being the intention to have as large an outside membership as possible, so that those engaged in the industry in various parts of the country may make the Concrete Association of New York their headquarters and have all the privileges thereof.

The committee on exhibition will proceed in due course to arrange for a permanent exhibition where there will be gathered together the representative products of the cement and concrete industry, including machinery and reinforcing material. There will also be a library of photographs and a collection of data where those interested may find drawings, photographs and all necessary information, so as to enable the inquirer to become thoroughly posted as to any particular phase of the industry in any part of the world.

The present officers of the association are as follows: Ross F. Tucker, of Tucker & Vinton, president; H. C. Turner, of Turner Construction Co., first vice-president and chairman of the Committee on Building and Insurance Regulations; H. C. Miller, of H. C. Miller & Co., second vice-president and chairman of the Committee on Membership; W. W. Benson, of the Standard Stone Co., third vice-president and chairman of the Committee on Permanent Exhibit; T. G. Barr, of the Vulcanite Portland Cement Co., secretary; Ronald Taylor, of Ronald Taylor & Co., treasurer.

The Lehigh Portland Cement Co. will erect a new plant at Fogelsville, Lehigh Co., Pa.

LYRIC THEATER, CLEVELAND, O.

The Lyric Theater, Boliver and Erie streets, Cleveland, Ohio, was converted and made over from a Lutheran church by giving it a new concrete front, the interior being reconstructed in reinforced concrete. Several 50-foot span reinforced concrete beams on the Hennebique system were built. The front, which we illustrate, is plastered concrete on expanded metal. The structure is as fireproof as concrete and steel can make it. The work was executed by H. M. Farrager, Rose building, Cleveland, Ohio.

Lyric Theater. Boliver and Erie Sts., Cleveland, O.

CEMENT SHORTAGE ON THE PACIFIC COAST.

California cement has to a great extent displaced the European brands on account of the difference in price, the California cement being sold at 50 cents per barrel less than the European brands. The California mills not being able to meet the demand has created a shortage on the entire coast. Work under contract having been taken at California cement prices contractors cannot afford to use European cement. In Seattle alone about 1,000 barrels of cement per day are consumed. This would entail a loss of $500 per day in the use of imported brands.

At Los Angeles several thousand men were laid off in November, suspending building operations to a great extent in that city.

Mr. Carl Leonhardt, the leading cement contractor on the coast, contracted for several hundred cars of cement to be shipped to the coast from Kansas plants, which began to arrive early in November when operations were again resumed.

California and the other Pacific coast states have always been larger consumers per capita than in the East. The extensive irrigation project by the United States government reclamation in the West, which involves the extensive use of Portland cement, has contributed to produce a shortage of cement for other purposes. Several Pacific Portland cement plants are increasing their capacity, due to the extraordinary demand during the past season.

A new plant is going up at Whatcom, Washington, capitalized by stockholders of the Condor Portland Cement Company at Antwerp, Belgium.

A company has been organized in Reno, Nevada, to erect a $100,000 plant near Clark Station, on the Truckee river, for the manufacture of Portland cement.

The German-American Portland Cement Company of La Salle, Ill., has increased its capital stock from $450,000 to $600,000.

The Davenport Rice Co. of Collingswood, N. J., has been incorporated. Capital, $125,000. Incorporators: Geo. W. Davenport of Collingwood, N. J., and H. H. Rice, Ocean City, N. J., to manufacture concrete specialties.

A company has been organized at Miami, Fla., with Samuel A. Belcher, president; E. Ford Wells, vice-president; Smiley M. Tatun, secretary, and Dr. Gillespie Enlee, treasurer, to manufacture artificial stone. Capital, $10,000. Machinery has been purchased.

National Concrete Co., Hoboken, N. J., incorporated. Capital, $100,000. G. Spencer Ridner, Harry B. Marchbank, Wm. V. Vanderbeck incorporators. Company will deal in concrete.

SUGGESTIONS ON THE USE OF HOLLOW CONCRETE BUILDING BLOCKS.

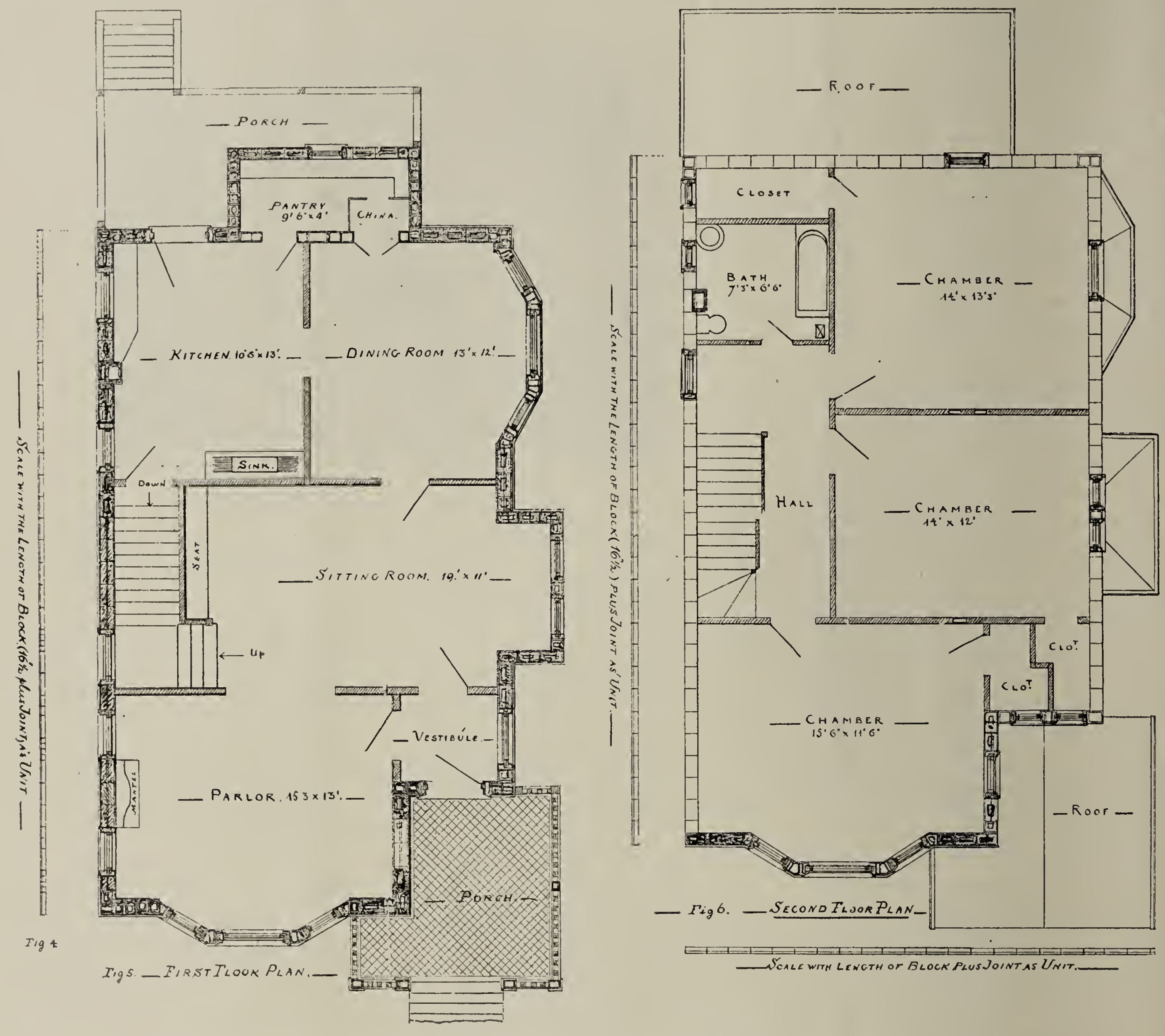
By Robert Kunstman..

It is very often the case that during the progress of industrial developments of certain new improvements and inventions, for instance in the manufacture of building materials such as sand and lime blocks, or the now so frequently adopted hollow concrete building blocks, deviations and departures from old and long-existing methods in construction are required before such improvements can merit general recognition or universal application. As a first question we may have to ask whether hollow concrete building blocks can safely enter as building material into competition with brick and stone which for ages held the foremost position as being elements for achieving stability and permanency for a structure.

Taking for granted that we can admit such blocks as a safe building material, the quality of the hollow concrete blocks must naturally be of faultless condition and equal to the best brick or most durable stone in texture, composition and finish. Perfect uniformity in size, accurate, square and correct forms as units for building blocks are in the first instance of the greatest importance; where the manufacturer has not yet succeeded in producing such blocks, architects could justly refuse to adopt them as good building material.

For various reasons it may be desirable that the dimensions of the block shall be comparatively large, still on closer examination of this important feature there is a limit essential.

As a standard size may be recommended for length 16½ inches, width 8¼ inches, and 8¼ to 9 inches height; with 4 1-16 as a divisor, and in addition blocks of double lengths and increased thickness up to 12 inches to 15 inches, because from a careful study as to variety of dimensions in walls of many houses this perfect standard will be found suitable and convenient. Of considerable importance it would be if such a unit could be faithfully maintained not only by one but by all makers of concrete blocks.



Floor Plans, Showing the Standard Bond Construction Applied to Concrete Building Blocks.

Let us compare for a moment hollow concrete building blocks when put together in a wall having joints broken and being in bond with each other, with well shaped and uniformly pressed brick set in a wall constructed in Flemish bond, and we can see at a glance that a much greater variety of dimensions can be produced in brickwork within a given length of inside or outside work before the returning corners, intersecting partitions or intervening door and window openings limit the extension of such walls, than can be produced. with building blocks.

The same great difference in the size of units between bricks and blocks must also influence the vertical layers or courses, and to maintain fixed dimensions is here as well as in the former case naturally somewhat limited and narrowed down.

The smaller the unit of certain building material the more perfect the interlocking can be accomplished so that with good adhesive binding material good strong work can no doubt be produced with small brick while on the other hand the larger unit of building block carefully bonded and jointed together will evidently save more labor in setting them and material in their composition as a building material.

If reasonable freedom in the interior arrangement of a house to the liking of the future occupant is preserved, if variety in taste and treatment of facades and exteriors in detached homes and villas are not abandoned. the architect must be at liberty to design and construct to meet the wishes of his clients, and for doing so he must be well informed what variety in dimensions can be produced in case hollow concrete blocks are adopted for his building material. In other words an understanding between architect, manufacturer and builder, so to say, a co-operation on the part of all is indispensable at least until the characteristic features of the building blocks in relation to the production of the greatest variety of dimensions and their practicability for decorative features are fully investigated and firmly established.

Quite a wide scope is yet open for the constructive talent of the architect who must be materially aided and guided by the manufacturer of concrete building blocks to devise and adopt such details that are practical and appropriate to the process of manufacturing, to an easy handling in the erection and suitable for constructing the building to the liking and comfort of the owner.

The carpenter's and joiner's work must also not be overlooked in the construction with hollow building concrete blocks, sizes and dimensions of millwork have to be duly considered and be adhered to in filling out openings for such work. All must be determined from the outset as it will be more difficult and expensive to make alterations in a building erected with hollow building blocks than is the case with brick or stone masonry.

Assuming that for the present manufacturers of hollow concrete building blocks with good and suitable machines can supply blocks that will give fairly great liberty in constructing and a reasonably wide scope for decorative details together with the important condition of regularity and uniformity of blocks of a standard size with a small divisor as previously pointed out. We will suggest a mode of designing and constructing with that material and endeavor to indicate a road to bring architect, manufacturer and the builder to a harmonious co-operation.

We refer to the adjoining plan, wherein Fig. 1 represents a geometrical elevation of a country residence made entirely of hollow concrete building blocks, the facade as well as the sides are composed of such plain or rock-faced blocks with ornamental belt courses and special window casings.

From the foregoing suggestions it will be necessary to lay out all the walls to a scale which is prepared with a unit, consisting of the standard size of block say 16½"x8¼"x8¼", inclusive of the motor joint, both give the length of the divisor. In applying this scale we can obtain all minor dimensions for outside as well as inside walls and determine all positions of windows or door openings always in conformity with the necessary bond and rules for breaking joints.

In Figures 4 and 6 such a scale is shown laid parallel with the sides of the ground plan or of any succeeding floor plan and from the application of this scale can always be ascertained what length of blocks will have to be procured, what fractional parts and their number in order to meet particular positions of windows and doors, etc.

In Fig. 2 we represent a sectional view and scale for the elevation. whereby the unit is composed of the height of each block (8½") together with the bed joint, by this means we not only determine all vertical dimensions, also in conformity with the height to which the blocks permit such dimensions. Another useful object is achieved if we figure each course; namely, the designation of all the courses right through the building will give to the manufacturer as well as to the builder a useful key to count and name for every course all the straight, fractional, corner or window casing blocks or specially shaped casings and sills contained in this particular course and subsequently by addition in the whole building. By preparing a list of the plain, fractional or special blocks required together with a rough diagram placed in the hands of the architect, by the manufacturer, and subsequently submitted to the builder for construction and advise all work into each other's hands, save confusion and expedite work.

A CONCRETE ROAD BED.

The Pennsylvania Railway has under construction five miles of experimental road bed between Rouks and Williamsburg, Pa., on the Philadelphia division. A solid bed of concrete is being laid, which is to be covered with ballast, upon which the ties will rest, the object being to prolong the life of the wooden ties, and at the same time produce a dustless roadbed. The life of the wooden tie is prolonged by providing a thoroughly drained bed. This is the aim of the company. Should the experiment prove successful this construction will be gradually extended year by year.

A suit to restrain the Empire Portland Cement Co. from operating its plant was brought by Mrs. S. A. Bentley on account of ashes and dust falling uopn her property, thereby decreasing its rental value $25 per year. The case was dismissed with costs on the plaintiff, the court holding while the company has no right to conduct its business so as to injure others. the company being equipped with all of the latest appliances and has more than $650,000 in its business. the granting of the injunction would give such small relief to one party and work much hardship to the other. the court was unable to grant it.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	OCTOBER				TEN MONTHS ENDING OCTOBER			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	....	....	6,525.600	$ 20,516	6,405.030	$ 22.186	13.387,800	$ 44 224
Belgium...........	21,398,586	$ 66,036	5,631,026	15,703	129,387,379	398,691	111,109,321	350,753
France............	467,800	2,027	297,600	1,277	11.307,692	38.369	5.811.400	20.930
Germany	20,303,313	72,714	25,664,824	96,497	168,929,680	572 207	131,350,903	447,040
All Other Europe.	297,600	1,954	....	....	2,695.047	10,265	240.659	609
British North Am.	35,050	187	35,400	204	226,450	1,179	165.110	1.591
Other Countries..	1,200	18	....	....	3,148,400	9,863	469.615	1,783
TOTAL.....	45,503,549	$142,936	38,154,450	$134,197	322,090,678	$1,052,760	262.534,808	$864.930
Domestic Exports of Cement, bbls.	103,851	$141,568	76.131	$108,027	531,761	$779,147	877,516	$1,194,041

There were 16,127,554 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Oct. 1905, valued at $48,548 against 7,208,644 lbs in Oct. 1905, valued at $........

For 10 months ending in Oct. 1904. there were 98,490 tons of asphalten imported in the United States, valued at $416,553, against 80,332 tons imported in 10 months ending Oct. 1905, valued at $339,489.

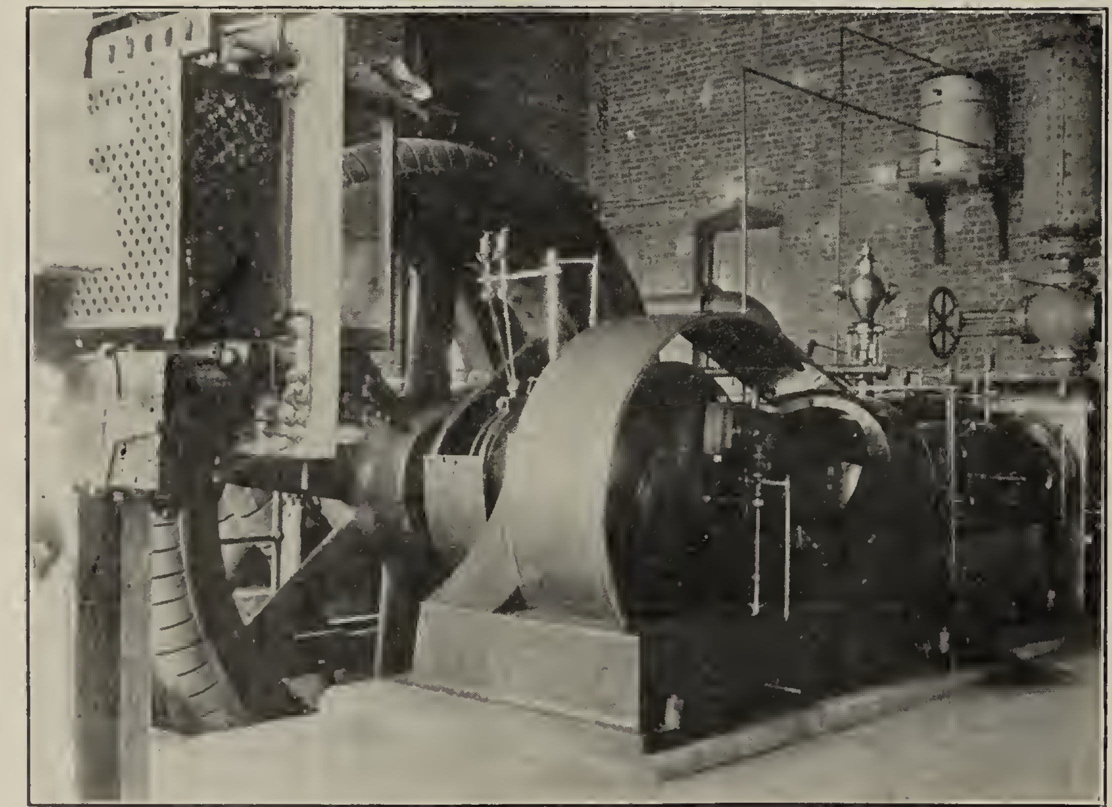
A MODERN PUZZOLAN CEMENT WORKS.

By Geo. F. Hetherington, Chemist, Ashland Ky.

The recently completed slag cement mill of the Ashland Iron & Mining Co., of Ashland, Ky., is modern in every respect.

The plant consists, essentially, of a power house, lime kiln, hydrating and storage house, granulating pit, locomotive crane, mill building and stock house. It is exceedingly well adapted for economical production.

Interior of Pozzolan Cement Mill, Ashland, Ky.



Power House, With Gravity Oil Feed System.

The company operates its own collieries, which furnish the fuel for the dryers, and the cost of fuel for power is practically nothing, as blast furnace gas is used for generating steam.

The power house is a brick structure, 30 feet by 42 feet, and contains an Atlas cross-compound non-condensing Corliss engine, with steam cylinders 22x36 inches and 32x36 inches, and a minimum rating of 600 horsepower. It is fitted with metallic packing and gravity and sight feed oil system.

The generator is a Stanley, 400-kilowatt, 480 volts, 3-phase, 60-cycle, and is direct connected.

Foundations are all made from a slag cement, sand, crushed cinder concrete.

The lime kiln is an improved No. 3 Keystone, 48 feet high by 6 feet 6 inches inside diameter. It has a capacity of 90 barrels (200 pounds) per 24 hours, and is equipped with a skip hoist, reducing the cost of charging very low. Limestone is unloaded from cars into the skip as needed.

The blast furnaces make Bessemer Ferro Silicon and High Silicon foundry iron, and produce enormous quantities of gas rich in hydrocarbons. This gas is used very successfully to calcine the limestone. It is fed to the kiln through 8-inch pipe into the four furnaces.

The limestone is a dense gray, very finely crystallized stone, secured from the Kentucky hills, and has the following average analysis:

		Per cent.
Silica		4.70
Iron oxid		.53
Alumina		.99
Lime		51.94
Carbonate	92.75	
Magnesia		.35
Carbonate	.75	
Carbon dioxid and water		41.38
Undetermined		.11
		100.00

From the kiln the quick lime is delivered to the lime hydrating and stock house by carts. It is a concrete building, 30 by 60 feet, with cement floor.

The quick lime is very carefully hydrated in wooden boxes about 5 by 12 feet by adding just the requisite amount of water as determined for this particular lime. It is then screened and conveyed to the mill.

Its analysis is as follows:

	Per cent.
Silica	7.32
Iron oxid	.99
Alumina	1.37
Lime	69.07
Magnesia	.99
Carbon dioxid and water	19.47
Undetermined	.79
	100.00

The slag, after issuing from the furnace, is suddenly quenched in water. The granulating pit is constructed entirely of concrete made from slag cement and crushed cinder.

It has the following dimensions: 21 feet wide, 40 feet long, 25 feet deep.

The granulated slag is removed from the pit by a locomotive crane, operating a clam shell bucket holding 2 cubic yards, and having a capacity of five tons, with a 20-foot radius.

It conveys the slag to the storage yard, a distance of 400 feet, where the excess of water is allowed to drain off.

The mill building is 45 feet wide, 90 feet long, with a lean-to 15 by 55 feet.

It is constructed of concrete blocks, with structural steel and slate roof. The concrete blocks were made of the following mixture: 1 cement, 2 sand, and 5 crushed cinder.

The moist, granulated slag is shoveled through a 1-inch mesh screen, 3x4 feet, and enters an elevator boot.

An 8-inch bucket conveyor elevates it 18 feet and discharges it into a 12-

inch spiral conveyor. This feeds three Ruggles-Coles dryers, 30 feet by 70 inches, making 9 revolutions per minute, and inclined 2-5 inch per foot. All surplus slag delivered to dryers is returned to elevator pit.

The dryers are heated by suction draft produced by three 72-inch fans making 300 revolutions per minute, discharging into a dust collector.

A 15-horsepower belted induction motor drives fans, feed elevator and conveyors to the tube mills.

The dried slag is delivered into a 12-inch spiral conveyor, which discharges into an 8-inch bucket conveyor, elevating it 27 feet. It is delivered into a steel storage bin having a capacity of 25 tons. An average analysis is as follows:

	Per cent.
Silica	42.00
Iron oxid	.55
Alumina	10.85
Lime	41.47
Magnesia	3.20
Sulphur	1.50
Undetermined	.43
	100.00

The hydrated lime is conveyed to an adjoining bin having a capacity of 25 tons.

An automatic feeding apparatus is attached to the storage bins. It is composed of variable speed conveyors controlled by cone pulleys. The hydrated lime conveyor is 6 inches in diameter and the slag 9 inches, both requiring 2 horsepower for operation. They deliver into hopper of feed end of an Allis-Chalmers tube mill. This mill is used as a mixer and preliminary grinder.

The mixer discharges into an 8-inch bucket conveyor, which elevates the material 10 feet, delivering into a 9-inch spiral conveyor, which feeds the three fine-grinding or finishing mills.

All the tube mills are of latest Allis-Chalmers type, 5 by 22 feet, lined with granite imbedded in slag cement grout. They are charged with 14,000 pounds of flint pebbles.

All mills are electrically driven, each geared to a 75-horsepower, 3-phase, 60-cycle induction motor. The motors are placed in the lean-to and are protected from dust.

The mills discharge into a 9-inch spiral conveyor, which delivers to an 8-inch bucket conveyor elevating the cement 27 feet. It is delivered into a 9-inch spiral conveyor running the entire length of the stock house.

The stock house is 45 feet wide by 90 feet long, and is constructed of concrete blocks, with structural steel and slate roof.

The hollow concrete blocks have a rock face and are 9x32x12 inches. It contains 4 bins, with a total capacity of 15,000 barrels.

Pozzolan Cement Mill, Storage Yards and Crane.

Hand packing apparatus is used.

Provision is made to pack direct from the conveyor delivering to the bins.

A tunnel runs the entire length of the stock house, in which are located the gates from the bins. Gates are 12 inches by 24 inches, and deliver into a 12-inch spiral conveyor discharging into an 8-inch bucket conveyor. The cement is elevated 25 feet to the packing machine, which consists of a 12-inch spiral conveyor, 18 feet long, having 5 spouts two feet long. A gate is located 8 inches from the lower end, with a slide cut-off.

All foundations in the mill building, hydrated lime building and stock house are made of slag cement concrete, having sand and crushed cinder aggregates.

The capacity of the plant is 550 barrels per day.

The chemical laboratory is built of slag cement, sand and cinder concrete.

The chemical and physical laboratories are equipped with modern appliances and apparatus used in the testing of cement.

Tests are made regularly during every stage of the manufacture.

The company manufactures the "Ashland Brand" Puzzolan cement.

A chemical analysis shows the following composition:

	Per cent.
Silica	35.72
Iron oxid	.84
Alumina	9.72
Lime	45.42
Magnesia	2.85
Sulphur	1.42
Ignition loss	3.66
Undetermined	.47
	100.00

Physical tests yield the following,—fineness: 96 per cent through 200-mesh sieve.

Activity.

Initial set.............3 hr. 40 min.
Final set.............8 hr.

Constancy of volume tests: Normal pat tests (Amer. S. C. E.) air pats (A.), good, sound and hard; cold water pat (B.), good, sound and hard.

Accelerated tests: Warm water test (Faya) (C), good, sound and hard; boiling water (U. S. A.) (D), good, sound and hard.

Tensile strength of standard briquetts (1 sq. in. section):

Neat—1 day, 137 lbs.; 7 days, 445 lbs.; 28 days, 545 lbs.

1 cement, 3 standard sand—7 days 150 lbs.; 28 days, 350 lbs.; 3 months, 427 lbs.

U. S. IRRIGATION PROJECTS.

The Secretary of the Interior has approved two New Irrigation Projects in New Mexico and Texas. There are twenty-four Government Reclamation schemes, of which eleven are well under way, which provide for the reclamation of 1,303,600 acres of arid land, at a cost of $37,028,571, of which $5,462,169 has been expended. The reclamation fund on hand on June 30, 1905, was $28,028,571.

The Government cement mill at Conto Basin has produced 15,000 barrels of Cement manufactured under the supervision of the Reclamation Service. Seventy-eight thousand additional barrels of cement have been purchased in open market for the work.

Hannaford-Cooperstown Concrete Co., Hanaford, N. D.; capital, $25,000. Incorporators: A. H. Berg, L. H. Berg, H. P. Hanson, H. O. Haugen, L. Almklov, T. M. Twingen, A. O. Anderson.

CEMENT BRICK TO THE FRONT.

We are all more or less familiar with the value—yes, real good value—of cement for building purposes. When the Miracle Pressed Stone Company of Minneapolis perfected their machinery for making the Miracle Double Air Space Building Blocks from cement we saw clearly that many problems and objections to cement as a building material would soon be overruled, as so it was. To-day cement building material holds a most satisfactory place of recognition, and is fast displacing lumber and other material, simply because it has value and its cost is most reasonable.

The Miracle Pressed Stone Company played a very important part in obtaining this universal recognition, but the good work has only begun. The Miracle boys are hustlers, pure and simple. They are always doing "Miracles." Their most recent accomplishment is the perfection of a new brick machine for making cement brick. There is nothing very miraculous in that, to be sure, for there are other good brick machines long since on the market. But the simplicity of the machine is what appeals to us. It is simple, but certainly no machine can do better work.

Miracle Cement Brick Machine.

One of the most desirable features is the fact that it can be operated by only one man, the only one-man machine on the market. All other machines require at least two men and usually three. One man with his material mixed and delivered can make three thousand to four thousand bricks per day on a Miracle machine. We think that is pretty good. It cuts down the cost of labor by at least one-third and that helps immensely in putting cement bricks to the front.

We hope that everybody that can possibly find the space—and it takes very little—will begin brick manufacture at once. There is no doubt of a big field for this line of effort, and those first to start will without doubt, secure the largest returns.

The Miracle boys have made a very deep study of the cement brick and its possibilities, and have arrived at the very wise conclusion that the field is just opening. This conclusion prompted them in the making of their new machine. They say they would be glad to hear from anyone who might be interested and especially to answer any questions which might arise.

We wish them continued success, not only with their new machine and their own immediate business, but in their efforts to place concrete blocks and cement brick more favorably in the minds of the building public.

HAIR CRACKS, CRAZING OR MAP CRACKS ON CONCRETE SURFACES.

By Albert Moyer.

The appearance of hair cracks on a concrete surface is a disfigurement, the cause and remedy for which have not received the proper study that so important a subject justifies. The cause of this trouble has been investigated from time to time, but heretofore the conclusions drawn have been very incomplete.

Hair cracks, being entirely on the surface, do not indicate a weakness in the concrete; in most instances they are not greater in depth or width than that of a coarse hair. A rough-surface concrete does not display these objectionable features to as great an extent as does an even-troweled face, on which surface they are very apparent especially in damp or wet weather. Often these cracks do not appear for several weeks or months after the concrete has set hard.

A practical worker in concrete is not as much concerned with the cause of hair cracks and crazing as he is interested in their effect and remedy. It often requires investigation as to cause to arrive at a correct solution of the trouble and thus apply permanent remedy, otherwise we would be simply dealing with symptoms.

Research conducted along theoretical lines seldom brings practical results, therefore the writer will endeavor to eliminate theory as far as possible. My investigation has been founded on the reverse practice; that of acting and observing very carefully the practical results, both as to effect and remedy, and then endeavoring to explain these conclusions by theory.

It has been known for some time that very wet concrete is more apt to craze and show these undesirable hair cracks than dry concrete. Dry concrete is objectionable from the standpoint of strength and density; and therefore its use cannot be advocated simply because hair cracks are to some extent avoided. Investigation and practical demonstration leave no doubt of the fact that in wet concrete a portion of the flour or very finest particles of the cement is carried to the surface by the action of the excess water which is being absorbed by the atmosphere. This excess water is to a great extent drawn from the interior of the stone to the exterior, carrying with it the finer particles, which being deposited on the surface form a richer mortar than is contained in the body of the concrete. Under certain conditions these fine particles deposited on the surface, practically form a coating of neat cement.

Neat cement or the richer mortars are found to be much more liable to crazing than mortars containing a larger proportion of sand or finely crushed stone. This is particularly true in the manufacture of cement stone by the use of sand moulds in which the mixture is poured very wet. It has also been noted, that when the stone is properly seasoned by keeping the surface covered with a thick layer of very wet sand, or when the stone is immersed entirely and for some time in water, the trouble has been overcome almost entirely. These hair or map cracks would be entirely eliminated for all time, if the stone were immersed in water for a sufficient period to allow the complete crystallization of the cement. This, however, is not always permitted by convenience or economy.

The crazing of neat cement is apparent in test pats for laboratory purposes, when these pats are exposed and allowed to set and harden in air. But, if they are protected in a moist closet and afterward immersed in water for a period of at least twenty-eight days, no hair cracks or crazing will result.

A careful examination of these cracks lead to the conclusion that they are due entirely to a contraction of the surface, the same contraction not taking place in the body of the concrete.

Experiments made by Prof. Swain and Prof. Bauschinger demonstrate that neat cement when set and hardened in air, contracts. This applies to all brands of high-grade Portland cement. Further tests demonstrate that this contraction increases with age up to a certain period. The same authorities demonstrate that a mortar made of one part Portland cement and three parts sand, hardened in air, shows contraction but less in proportion than the neat cement. It is obvious that this bears out the practical investigations regarding concrete and cement stone which have been described above; that is, hair cracks are due to contraction of the surface and that this contraction is due to the fact that the concrete has been hardened in air.

I will now describe the results obtained by investigations made by the same authorities, and others, showing the effects of neat cement and mortar when hardened under water. The test pats or cubes of neat cement and mortar, after the final set, were immersed and kept under water for a considerable period of time. The results prove that neat cement, when hardened under water, shows a slight expansion, while mortar composed of one part Portland cement and three parts sand shows an expansion, but less, in proportion, than the neat cement.

Reducing these conclusions to figures and taking the average results obtained by various authorities, figuring the expansion and contraction in percentage, I find the following results:

Neat Portland cement hardened in air, at the end of sixteen weeks, shows a .15 per cent contraction.

One to three mortar hardened in air, at the end of sixteen weeks, shows a .05 per cent contraction.

Neat Portland cement hardened under water, at the end of sixteen weeks, shows an expansion of .05 per cent.

One to three mortar hardened under water, at the end of sixteen weeks, shows an expansion of .015 per cent.

Without going further into the matter of figures, it is safe to state that the expansion and contraction is less for shorter periods than sixteen weeks, and that the percentage will be a trifle greater if carried beyond sixteen weeks, or up to six months, or a year.

We can, therefore, conclude that in a rich mortar there is more neat Portland cement on the face, and, therefore, a greater percentage of contraction of the surface; also, that a less rich mortar will show a proportionately less percentage of contraction, and, if the concrete were kept wet and protected (which is equivalent to hardening under water), hair cracks and crazing would be avoided.

In the past, this trouble has been partially overcome by brushing off the surface of the concrete or cement stone, with a stiff steel brush, or by scrubbing the surface with a cement brick and wet sand, thus partially removing what might be termed a neat cement face. It has been found, however, that this does not entirely overcome the trouble, the remedy proving but temporary, the cracks appearing several months afterward. The brushing or scrubbing is merely an assistance; the real remedy lies in keeping the surface thoroughly and continuously wet as long as possible. It is unfortunate that this rule is seldom observed, and that in its non-observance, good results are sometimes obtained. The worker in cement is thus influenced to disregard a matter of considerable importance in concrete construction. That good results are obtained from a disregard of these principles is largely a matter of luck. If the weather be damp for a number of days after the concrete has set, the object has been partially brought about by nature; then, again, the surface may have been so placed as to escape exposure from the wind or sun, which would tend to dry it, and was kept wet by the excess of water in the concrete. It is desirable to have the surface of the concrete or cement stone as near the same texture as the body of the concrete.

The only permanent remedy which will eliminate entirely these objectionable features is the removal of as much of this excess of neat cement collected on the surface as is possible as soon as the moulds are taken down. The surface should then be kept wet by the application of wet sand, sprinkled from time to time with water, or hanging wet cloths over the perpendicular surfaces, keeping the exterior wet and the cloths wet by sprinkling or by any other method which will accomplish this result. The surface should be kept continuously wet for a sufficient length of time, to enable the cement to attain ultimate crystallization. By so doing, the effect is practically the same as that of hardening under water. It is reasonable to conclude that, if so treated, the surface will slightly expand, but not to a greater extent than the body of the concrete which is already wet.

It is not amiss to bring this whole subject as prominently as possible before those having charge of concrete construction, endeavoring to impress upon them the necessity of keeping concrete protected and thoroughly and continuously wet for as long a period as economy will permit.

ALBERT MOYER.

Flatiron Bldg., New York,
Dec. 9th, 1905.

The Hanover Portland Cement Co.,
Hanover, Ont., Dec. 18, 1905.

To the Editor Cement and Engineering News, Dear Sir: I was recently reading a short account of the adoption in France of a Carborundum cement as a special refractory lining for furnaces. This cement, prepared by the mixture of 3 parts of carborundum to 1 of sodium silicate, is applied as a coating to the existing lining, and as the temperature of the production of carborundum is somewhere in the region of 3,500 degrees C, this of course forms an extremely refractory lining which is also unacted upon by chlorine, bromine, sulphur and oxygen at a temperature of 1,200 degrees C.

Now I should like to know if within the knowledge of yourself or any of the readers of your valuable journal, this idea has been applied to rotary kilns? If so, with what success? Is it applicable? Or has the lime of the cement mixture an appreciable effect on the silicon carbide at the temperature of production of rotary clinker? I should be very pleased to hear an expression of opinion on this matter from other readers of the Cement and Engineering News.

Yours faithfully,
Geo. H. Musgrove,
Chemist.

Options are being taken on lands in Polk Co., Georgia, near the Southern States Cement Plant for a new Portland cement enterprise.—Cedartown, Ga.

A company is being formed at Mason City, Iowa, to erect a Portland cement plant in that city; $250,000 is to be raised by Mason City people, the remaining capital will be supplied by outside parties.

The grants made by the corporation of Bay City, Mich., to the Hecla Portland Cement Company are to be forfeited unless the company and its successors carry out its obligations, suit having been commenced with this end in view. The failure to light the west side of the city being one of the obligations the company agreed to perform and has not carried out. The company gave an indemnity to the city as a guarantee that it would fulfill its obligations.

The Concrete Shingle and Block Company, of Columbus, Ohio, was incorporated Monday, with $10,000 capital stock, by H. E. Hatch, Samuel J. Barns, Henry Shuster, Earnest W Lane and J. K. Barnes. They will make concrete shingles and blocks by a secret patent process.

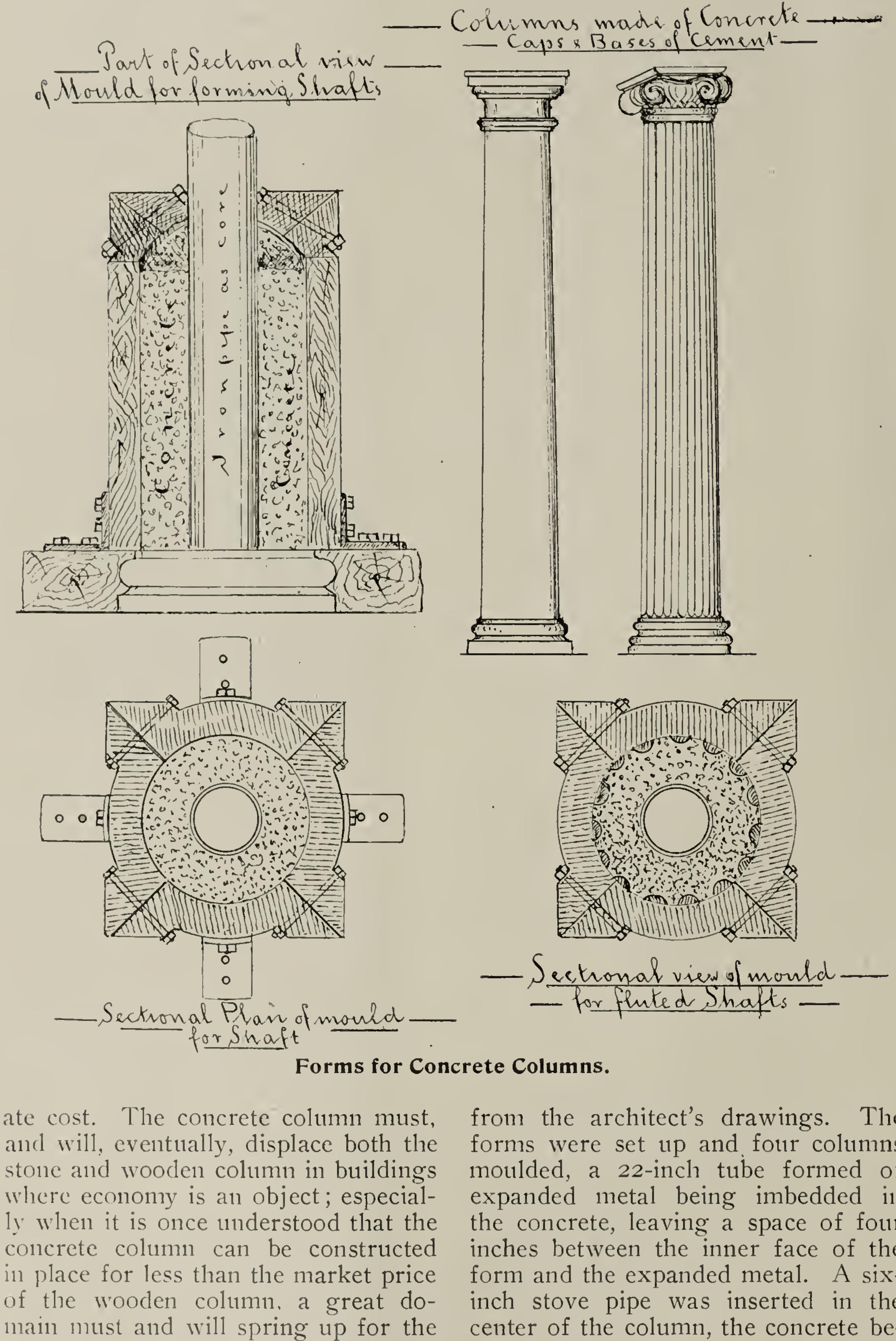
A Portland cement plant is projected at Staunton, Ky., on the Lexington & Eastern Railway. J. C. Patrick of Powell Co., C. G. Holmes, chemist of Columbus, Ohio, has been employed to examine the raw materials. Good clay and a 15-foot rock deposit covering 75 acres are on the proposed site for the plant.

Dover, Dec. 21.—Certificates of incorporation were filed here yesterday as follows: Iron City Portland Cement Co., Pittsburg, Pa., to carry on the business of quarrying, mining, milling and treating lime stone and other minerals and the manufacture of the same into cement, lime or other products or byproducts. Incorporators, James F. DeLong, A. F. Johnston, Charles F. DeLong, all of Pittsburg, Pa. Capital stock, $1,000,000.

FORMS FOR MOULDING CONCRETE COLUMNS.

Plain and ornamental wooden columns are extensively used in this country for both the exterior and interior work in public and private buildings. Large factories for their production exist in various parts of the United States. They find favor with architects on account of their reasonable cost, as compared with stone.

The concrete column is now being introduced, on account of its more durable properties, as well as moderate cost. The concrete column must, and will, eventually, displace both the stone and wooden column in buildings where economy is an object; especially when it is once understood that the concrete column can be constructed in place for less than the market price of the wooden column, a great domain must and will spring up for the concrete column. In this respect, we present a few figures. The market price of a fluted column, including capitals and base, 20 feet high by 30 inches in diameter through the column proper, just above the base, will cost, in wood, at the factory, $85.00; transportation charges to the building site, extra. The form for moulding such a column in concrete will cost $100.00 to produce, and can be made by any good cabinet maker at the price named, or less, as columns are never used singly. Therefore, we assume that four columns will be moulded from the column form in the same building; the cost of the form must be distributed over the four columns, which will be $25.00 each, or $100.00 for the four. This being the exact cost of such a form made by the day, by a Chicago cabinet maker, working from the architect's drawings. The forms were set up and four columns moulded, a 22-inch tube formed of expanded metal being imbedded in the concrete, leaving a space of four inches between the inner face of the form and the expanded metal. A six-inch stove pipe was inserted in the center of the column, the concrete being deposited from the top around the pipe. The entire column was formed in one operation, the sand and gravel used on the work being obtained at the building site. The labor, material, cost of form and supervision represent an outlay, for the four columns complete and in place, of $200.00, or $50.00 each, resulting in a saving of $35.00 per column, or $140.00 on the four concrete columns, compared with the price of the wooden columns. Six other columns were subsequently erected of concrete on the river front of the same building, using the same form. This reduced the price of the form to $10.00 per column, while the concrete and labor of placing into the form was $25.00 per column, or $350.00 for the ten concrete columns complete, as against $850 for wooden columns, showing a net saving of $500.00 on the ten columns in favor of concrete.


Part of Sectional view of Mould for forming Shafts
Columns made of Concrete
Caps & Bases of Cement
Sectional Plan of mould for Shaft
Sectional view of mould for fluted Shafts

Forms for Concrete Columns.

Our illustrations show a form for moulding plain and ornamental columns in sections, as well as the finished columns. The mould is composed of four quarter sections bolted together as shown. The column should be moulded in a form the full height of the column, for clean work. Only columns of approved shape and architectural design as laid down by the old masters of art should be used, which will always produce a pleasing artistic design. As the column in process of construction will tend to rise and shift the form, it must be bolted down to the floor or foundation, as shown in the sketch, by angle irons.

CONCRETE SPECIFICATIONS FOR THE KALAMATH PROJECT, U. S. RECLAMATION SERVICE.

The works involve the construction and completion of nine miles of main canal in the Klamath basin in southern Oregon and northern California together with such auxiliary structures shown in eleven sheets of working drawings and described in the specifications for irrigating lands in the Kalamath basin. The concrete work in Schedule 1, Division 1, consists of 3,100 feet of tunnel lining, 4,000 cubic yards of canal lining, bridge piers, turnouts, culverts, head work and tunnel portals, and ten cubic yards of reinforced concrete, all in Division 1.

Division 2 will require 400 cubic yards of concrete and 150 cubic yards of reinforced concrete.

In Division 3, 350 cubic yards of concrete and 100 cubic yards of reinforced concrete are called for.

Paragraphs 59 to 72 of the specifications substantially cover the concrete work, which are as follows:

CONCRETE.

59. *Definition and Classification.*—All monolithic masonry, composed of hydraulic cement, sand and gravel or broken stone, will be classified as concrete, unless steel rod reenforcement be incorporated in the mass when it will be classified as reenforced concrete. The cement and steel rods will be furnished by the United States, and unless included as part of the cost

of a structure, the concrete will be paid for per cubic yard in place, the price to cover all work and material incident thereto except excavation, and the cement and steel rods as hereinabove provided.

60. *Sand.*—The sand shall be sharp, free from organic matter, shall not contain more than ten per cent of clayey matter; it shall be of such size as will pass a screen of ¼ inch square mesh, and shall be a mixture of sizes satisfactory to the engineer.

61. *Gravel.*—The gravel shall be clean, hard, have a specific gravity of at least 2¼ and of such size as will pass a screen of 2-inch and be retained on a screen of ¼-inch square mesh.

62. *Broken Stone.*—Broken stone shall be hard and compact and have a specific gravity of at least 2¼. Crusher run will be accepted, and all rock must be of such size as will pass a screen of 2-inch square mesh. It must be satisfactory to the engineer.

63. *Proportions.*—Unless otherwise specified by the engineer, the proportions used shall be for piers 1 part Portland cement in its packed condition, to 3 parts sand to 7 parts gravel or broken stone, all measured in volume, with sufficient water added give the mass a quaking consistency, and for lining of tunnel and canal, the proportions shall be 1 part Portland cement, to 2½ parts sand, and to 5 parts gravel or broken stones, all measured as above defined.

64. *Mixing.*—Mixing will be done by machine unless the quantity required for any structure is less than 100 cubic yards, when hand mixing may be used by permission of the engineer. The machine used for mixing shall at all times be subject to the approval or order of removal by the engineer. Where hand mixing is resorted to, it shall be done in the following manner: Upon a tight floor spread the sand to a depth of about 4 inches, and over this spread the cement, turn with shovels with the material dry until a uniform mixture is secured, add water and turn again to form a good mortar. Upon this spread the broken stone or gravel, thoroughly wet the same, and turn again with shovels, two times or more, adding meanwhile sufficient water to thoroughly mix the mass, and bring it to a quaking consistency. It shall be mixed in batches of such size as to permit the entire quantity to be placed and tamped before the concrete takes its initial set, and any unplaced concrete, which has taken its initial set, shall be removed from the vicinity of the work.

65. *Placing.*—All surface upon which the concrete is to be laid must be clean and thoroughly wet before the concrete is deposited and if so ordered by the engineer, suitable foundation of broken stone, gravel, or timber shall be provided by the contractor. Under no circumstances, shall concrete be laid in deep, moving, or muddy water, or dropped from heights exceeding 12 feet. Concrete shall be used "wet" whenever practicable, and "dry" only when rendered necessary by circumstances. If laid "dry," the concrete shall be well tamped with heavy tamping bars until water just flushes to the surface, and if laid "wet," with suitable bars and shovels so that porosity and rough surfaces may be avoided. No concrete shall be mixed or placed in freezing weather, except by permission and under the special direction of the engineer.

66. *Rubble Stone.*—Rubble stone may be incorporated in the concrete, provided, however, that no stone shall have a specific gravity of less than 2.3 and a dimension greater than one-half the thickness of the wall in which it is placed, that it be not less than 4 inches from any face of the wall, that it be separated by not less than 4 inches from any other rubble stone, that it be thoroughly wetted, and that the concrete be thoroughly tamped around and under it.

67. *Steel Reenforcements.*—In reenforced concrete, the steel rods shall be carefully placed in the position indicated on the plans, and if necessary, a smaller stone or gravel than hereinbefore provided may be required by the engineer, to secure a proper adhesion to the rods, and no extra allowance will be made for any such change in the character of the concrete.

68. *Joining Work.*—In joining new work with old, the latter must be thoroughly cleaned of all dirt and loose material of every kind, must be thoroughly wetted and if necessary roughened before the new concrete is applied.

69. *Forms.*—Forms shall be of such size and form as to contain the concrete true to the dimensions shown on the plans, of such strength as to resist all internal pressures without bulging or deflection of its sides, and shall be made of lumber surfaced on one side and both edges to insure smooth surfaces on all exposed concrete structures. If necessary special flat shovels shall be furnished and used by the contractor to effect this purpose.

70. *Inspection.*—All concrete must be mixed and laid in the presence of an inspector.

71. *Protection.*—Until the concrete has set sufficiently, the contractor shall protect it by constant wetting, by covering with damp earth, or other material, or by both these methods, as may be required by the engineer.

72. *Delivery of Cement and Steel.*—Cement and steel rods for concrete reenforcement will be furnished by the United States and will be delivered on board the cars, at the railroad station considered by the engineer most accessible to the work. The contractor will be held responsible to the railroad company for demurrage and must haul cement and steel from the railroad station to the works. He shall furnish suitable warehouses or sheds for storing the cement or steel, and will be held responsible for any loss or damage after its delivery at the railroad station. If the cement is shipped in sacks, the contractor will be held responsible for their return to the station and will be charged for all lost or damaged sacks at the same rate as paid by the United States. The contractor must give the engineer 60 days' notice as to when he will require the cement and must express definitely in barrels the amount he will require.

Rapid City, S. D., Dec. 20.—A large company has been organized here for the purpose of building a 700-barrel cement plant near town. Recent experiments have been made on materials used in the manufacture of cement, found near Rapid City, the result being that the manufactured product can be made unusually pure and of the best quality. Work on the plant is to commence early in the spring. The School of Mines has made thorough examinations of the raw cement materials controlled by the company and pronounce it first class cement rock, free from magnesia.

The Marquette Portland Cement Co. has purchased a motor car to be used to transport the office force from its Works to La Salle.

Five men were injured on Dec. 20 at the Alpha Portland Cement Co.'s Martin's Creek plant by the explosion of powdered coal. One of the buildings was badly damaged.

Frost Proof Cement. A cement suitable for mortar for laying bricks and stone masonry and for concrete work during freezing weather, has been placed upon the market at Vienna, Austria, by Heinrich Hauslitner, whose address is Wien, XII., 2, Meidling, Bendlgasse, No. 13. For particulars address as above.

The books of the Minona Portland Cement Co. have been opened at the City National Bank at Selma, Ala., for subscriptions to its capital stock. The plant will be located at Epes Station, Ala., the raw cement material being practically the same as that found at Demopolis, Ala., where the Alabama Portland Cement plant is located.

The Puget Sound Portland Cement Co. has been organized. A plant is to be erected on the northwest side of Orcas Island, one of the San Juan group, lying between Victoria, B. C., and the mainland, opposite Skoyet county, Washington.

THE HARBISON-WALKER SALES

The Harbison-Walker Refractories Company of Pittsburg, Pa., reports the demand for its products as very large and constantly increasing. Some of the larger contracts on which it is now shipping or which it has recently completed are as follows:

BLAST FURNACES AND STOVES.

Brick for complete lining for one blast furnace and four stoves, pipe connection, boiler settings, etc., for Midland, Pa.

Brick for complete lining for two blast furnaces and eight stoves, pipe connections, boiler settings, etc., for Youngstown, Ohio.

Brick for complete lining for one blast furnace and four stoves, pipe connections, boiler settings, etc., for Chicago, Ill.

Brick for three complete furnace linings to Sydney, Nova Scotia.

Brick for one complete furnace lining to Wharton, N. J.

Brick for two complete furnace linings to Bethlehem, Pa.

Brick for two complete furnace linings to Buffalo, N. Y.

Brick for one complete furnace lining to Detroit, Mich.

Brick for one complete furnace lining to Canal Dover, Ohio.

Brick for one complete furnace lining to Sharpsville, Pa.

Brick for one complete furnace lining to Harrisburg, Pa.

Brick for complete linings for nine stoves to an eastern iron company.

The above orders call for approximately 17,125,000 brick.

BEE HIVE COKE OVENS.

1,700,000 brick for the territory of New Mexico.

1,000,000 brick for the Connellsville Basin Coal & Coke Co.

700,000 brick for the West Virginia Coal & Coke Co.

200,000 brick for the Perry Coke Co.

1,000,000 brick for the Washington Coal & Coke Co.

BY-PRODUCT COKE OVENS.

2,500,000 brick for the Harrisburg district.

Also many other orders from cement manufacturers, including one for complete linings for fifteen rotary kilns for Kansas and Texas.

The company is also experiencing an exceedingly large demand for silica brick for open hearth steel furnaces, glass furnaces, copper furnaces, etc., and magnesite and chrome brick from open hearth steel works, copper works, etc., and also a large run of carload orders from regular consumers for all classes of refractory materials.

As conrtacts for refractory material are usually placed considerably in advance of the date of completion of plants, the Harbison-Walker Refractories Company is in a favorable position to judge of the possibilities and prospects for the future. The very large demand for refractory material is an excellent indication of an active state of business for sometime to come.

INCORPORATIONS.

Federal Concrete Steel Company, registered office, 15 Exchange place, Jersey City; agent in charge, Corporation Trust Company; capital stock, $250,000; incorporators, Louis B. Dailey, Thomas F. Barrett, L. H. Gunther. The company is to build houses and sidewalks.

Ewing Concrete Machinery Company, Akron, Ohio, by L. D. Ewing, J. E. Shelhart, John Shaffer, A. E. Hemtselman and W. Oliver Wise; capital, $10,000.

The Iola Portland Cement Co. has declared a 4 per cent dividend on $3,000,000 common stock, and 7 per cent on $1,500,000 preferred.

The Hecla Portland Cement Co. is to be reorganized, a syndicate of former stockholders having purchased the plant under judicial sale at $525,000.

Selma—Cement Plant. — Minona Portland Cement Co., reported last week as being organized for the establishment of Portland cement plant at Epes Station, Ala., will build and equip plant for a daily output of 1,000 to 1,500 barrels. The company will have a capital stock of $400,000; main office at Selma, Ala.

The Wolverine Cement Co. manufactured 490,228 barrels of Portland cement from April 1st to November 1st, and has paid $60,000 dividends in four installments on a capitalization of $1,000,000.

Art Portland Cement Co., Syracuse, Ind., to manufacture and sell Portland cement, etc. Capital stock, $500,000. Geo. W. Miles, William C. Hillabald, Melville H. Smith.

The Sandusky Portland Cement Co. has shipped two car loads of lime stone rock from Dixon, Ill., to its Syracuse, Ind., plant for the purpose of testing the same as a cement material.

J. B. King & Co. has been incorporated. Capital, $600,000; to manufacture cement and paint. Directors, J. B. King, G. B. King, L. W. King, J. A. King and Horace F. Hutchinson, all of New York.

The Rocky Mountain Cement Co. of Salt Lake City has been organized. Capital, $250,000. The plant is to be located near Salt Lake City or Ogden, Utah. Carl Leonhault and Amon Moore are interested parties.

The Portland Cement Co. of Toronto, Canada, has been organized. Capital stock, $400,000.

Whitney Newton, late state treasurer of Colorado, and president of the Sayre-Newton Lumber Co. of Denver, has purchased the controlling interest in the stock of the Portland Cement Co. of Portland, Colo.

The Alpha Portland Cement Co. has purchased the Morris Rutherford farm, one mile from Hamburg, Sussex Co., Pa. Options have been secured on other tracts. These lands carry large deposits of pure lime stone which will be used by the company's various plants in the manufacture of Portland cement.

The Edison Portland Cement Co. will expend $500,000 in improvements to bring the capacity of its plant up to 6,000 barrels per day.

Options are being taken on lands near Cedartown, Polk Co., Ga., for a new cement plant. The Southern States Portland Cement Co. now operate a plant at Rockmart in the same county.

BOOK NOTICES.

"Proceedings of the Concrete Block Machine Manufacturers' Associaciation." 42 pages. Paper cover.

This booklet contains a full report of the proceedings of the Concrete Block Machine Manufacturers' Association Convention held at Chicago June 27 and 28, 1905. Copies can be obtained from Sid. L. Wilke, Jackson, Mich.

"The Diversified Uses of Portland Cement." Illustrated. 84 pages. 9½ x 6 inches. Published by the Wm. G. Hartrauft Cement Co., sole selling agents for the Old Dominion Portland Cement. Real Estate Trust Bldg., Philadelphia, Pa.

This is one of the handsomest illustrated publications that has come under our notice. covering almost every kind of cement constructions from the highly artistic towers and interior of the Atlanta Terminal station erected in reinforced concrete throughout to the rough, massive concrete lock on the Kentucky river near Ford, Ky. A number of handsome concrete dwellings are given, showing the artistic possibilities of concrete for this class of work, executed by competent labor and supervision after plans and specifications prepared by first-class architects.

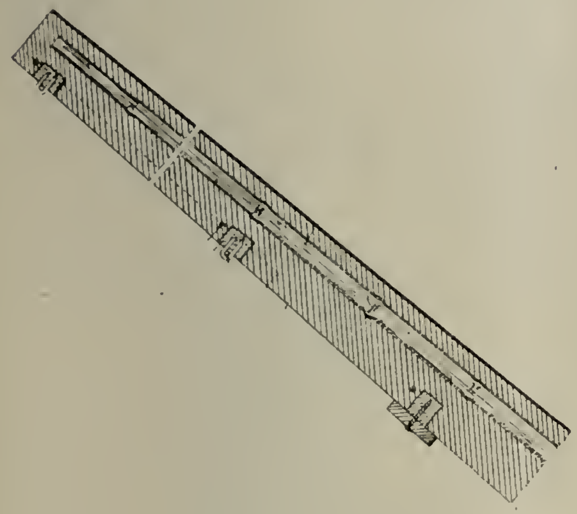
The constructions shown were all executed with the old Dominion Portland Cement.

The one distinctive feature in these illustrations is, there has been no attempt to imitate natural stone but rather to demonstrate the possibilities of concrete as a suitable material of construction for dwellings and public buildings of pleasing and artistic design. The book is distributed without charge.

U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

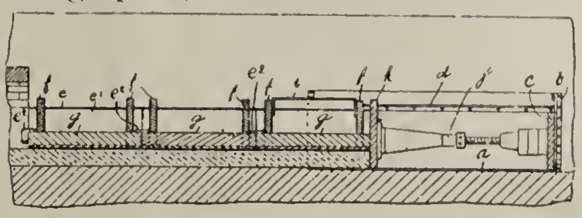
803,615. Cement Fence-Post. Asa Moler, Iowa City, Iowa. Filed Aug. 3, 1905. Serial No. 272,599.

Claim.—1. An improved post comprising a number of longitudinally-arranged cornstalks and a cementitious composition surrounding the cornstalks and filling the spaces between them.



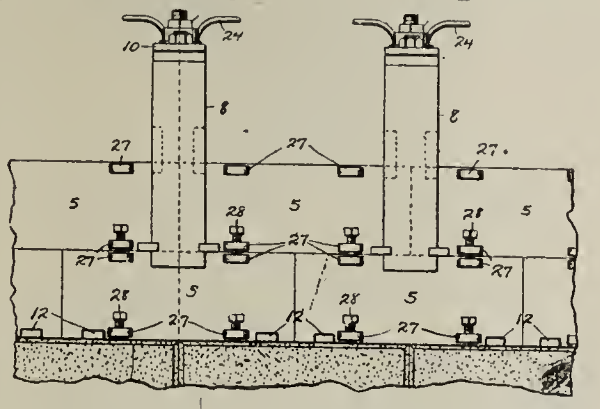
803,680. Device for Forming Concrete Sewers. Robert R. Evans, Haverhill, Mass. Filed Mar. 24, 1905. Serial No. 251,797.

Claim.—1. An apparatus for the purpose described comprising an outer mold, an inner mold, and longitudinal support on said outer mold for holding the inner mold in a position therein to provide an intervening filling-space, the rear end of said outer mold being open to permit the outer mold to be moved longitudinally out of engagement wtih the inner mold, substantially as described.



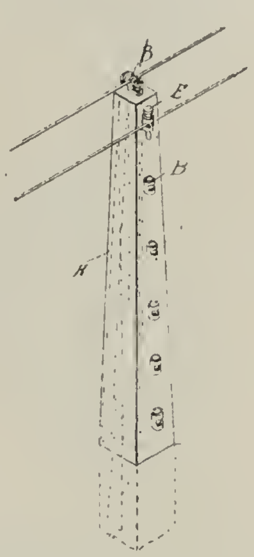
803,703. Device for Building Concrete Walls. David A. Milam, Kansas City, Mo. Filed Apr. 1, 1905. Serial No. 253,267.

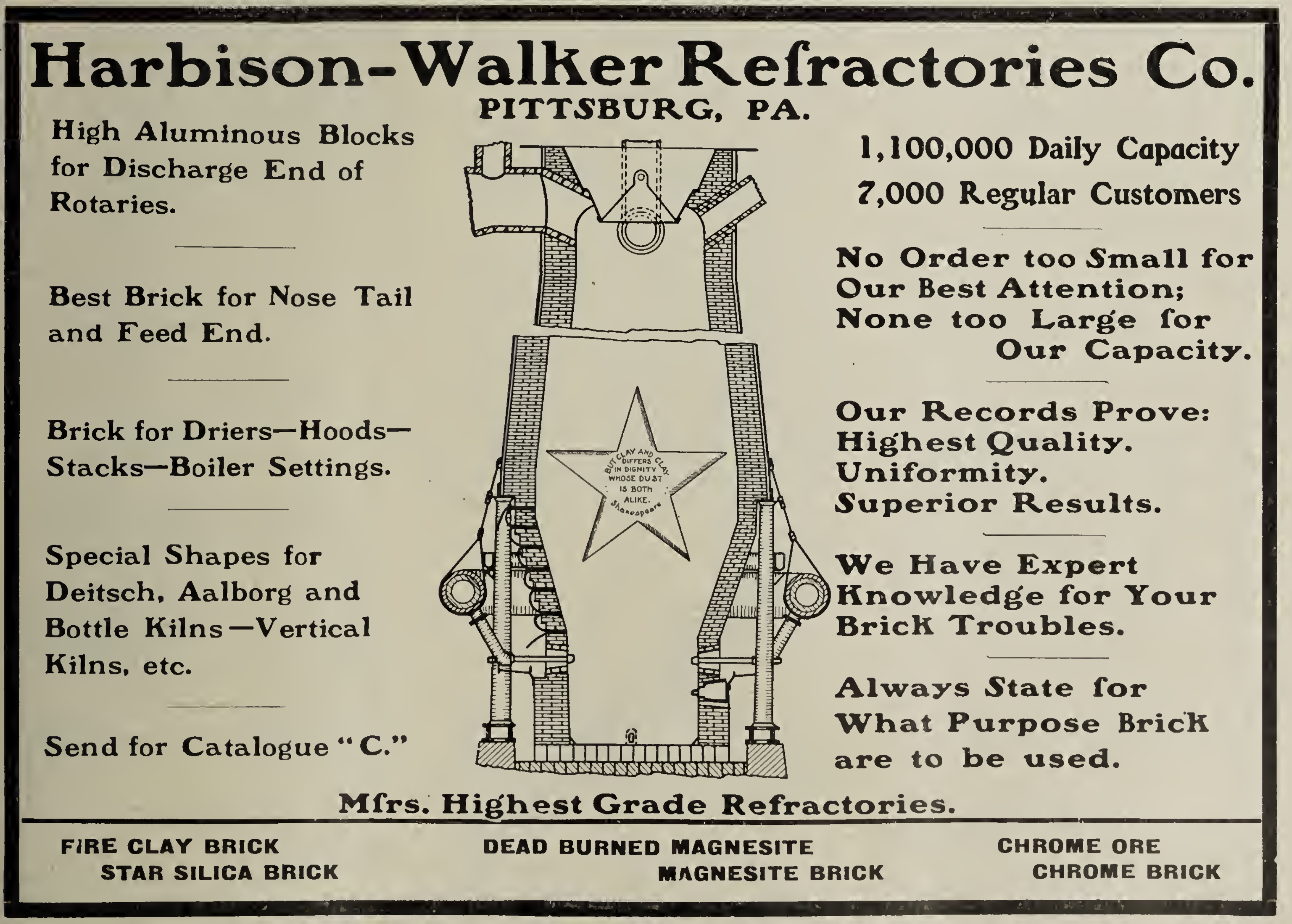
Claim.—1. In a device for the purpose named, a pair of abutting outside mold-plates, a pair of abutting inside mold-plates, an outside and an inside upright, covering respectively the junctions of the outside and the inside mold-plates, a bifurcated seat-plate lying transversely in or upon a wall, one end thereof engaging the outside upright, and being adapted to be removed from the wall in the direction of its length, and a cross-bar connecting the upper end of the outside upright to the upper end of the inside upright; substantially as described.



803,706. Cement-Post Fastener. Henry McMaster, Detroit, Mich. Filed Aug. 10, 1904. Serial No. 220,216.

Claim.—1. The combination with the cementitious body material of a fence-post, of a plurality of fastenings consisting of sections of metallic bands bent upon themselves and having their inner ends hooked, of slots in the opposite ends, of shoulders on the inner portion of the slots terminating outside of the cementitious body against which the fence-wires are

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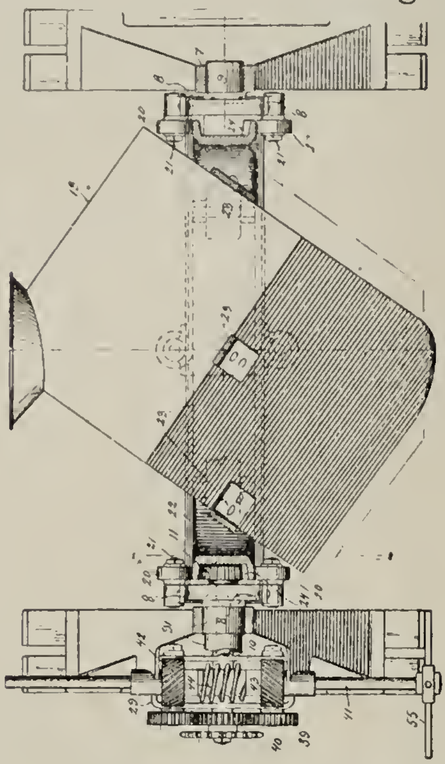
DEAD BURNED MAGNESITE
MAGNESITE BRICK
CHROME ORE
CHROME BRICK
But clay and clay differs in dignity whose dust is both alike. Shakespeare

kinked by means of the fastening-pins, substantially as described.

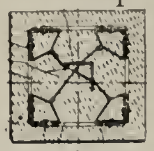
803,721. Mixing-Machine. Thomas L. Smith, Milwaukee, Wis., assignor to The T. L. Smith Company, Milwaukee, Wis., a Corporation of Wisconsin. Filed Aug. 28, 1902. Serial No. 121,282.

Claim.—1. In a mixing-machine the combination of a mixing-receptacle, means for rotating said receptacle, a frame in which the receptacle is revolubly mounted, said frame provided with projecting trunnions supported in suitable bearings, a gear-wheel mounted fast on one of the trunnions, a gear member engaging said gear-wheel, right and left hand spiral worm-wheels on the shaft of the gear member, an oscillatory frame having shafts mounted therein and geared together, worm-gears on two of said shafts and normally out of engagement with the worm-wheels, means for driving one of the shafts, means for oscillating the oscillatory frame, whereby, when oscillated in one direction, one of the worm-gears thereof is brought into engagement with one of the worm-wheels, and when oscillated in the opposite direction the other of the worm-gears is brought into engagement with the other worm-wheel, and a spring-actuated pin normally engaging the frame so as to hold said frame at such position that both worm-gears thereof are out of mesh with the worm-wheels, and said pin automatically disengaging the frame when said frame is oscillated in one direction, and automatically engaging the frame when the frame is brought back to normal position.



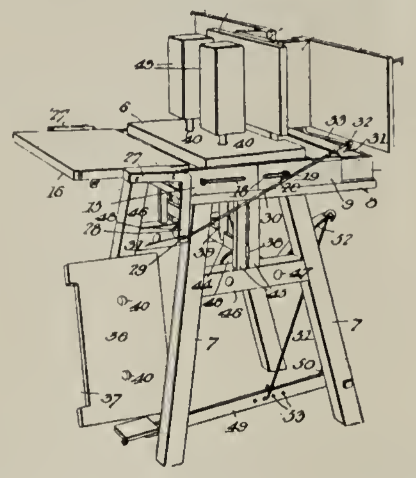
803,785. Cement Fence-Post. Judson K. Purinton, Des Moines, Iowa. Filed Mar. 2, 1905. Serial No. 248,743.

Claim.—1. In a post, the combination of four longitudinally-arranged angle-bars, straps secured to the end portions thereof rigidly securing them in position spaced apart, a central angle-bar, means for supporting the central angle-bar in position between the corner-bars and a plastic substance surrounding the frame and filling the spaces between the angle-bars.



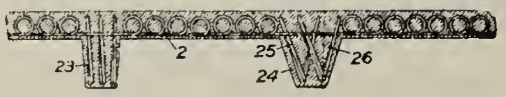
803,823. Cement-Block Machine. John I. Hancock, Lestershire, N. Y. Filed Sept. 3, 1904. Serial No. 223,260.

Claim.—1. In a machine for forming hollow concrete building-blocks, the combination with a frame, of a mold supported by said frame, a removable bottom board for said mold, a core-ejector passing through openings in said bottom board and provided with terminal sockets, detachable core members engaging the sockets in said core-ejector, and means for operating the ejector to thereby elevate said core members.



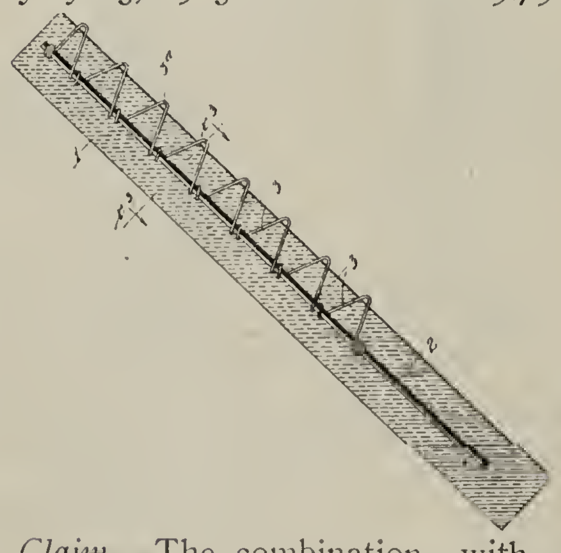
803,852. Metal-and-Concrete Construction. Charles L. Raymond, Rochester, N. Y. Filed June 3, 1904. Serial No. 210,972.

Claim.—1. The combination of a body of concrete, and embedded therein, a continuous strengthening member consisting of a single rod bent into a series of non-helical loops whose ends cross.



2. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of similar non-helical loops whose ends cross.

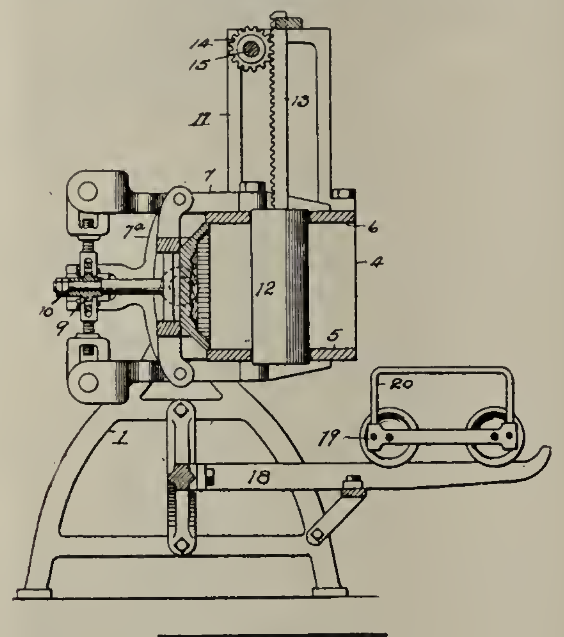
803,861. Concrete Fence-Post. Casper Spiess, Norwood, Minn. Filed July 15, 1905. Serial No. 269,792.



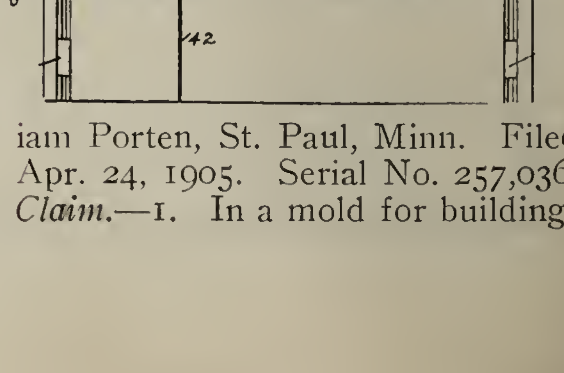
Claim.—The combination with a concrete body 1 of a fence-post, of a metallic rod or core 2 embedded within and extending longitudinally of said post, and the wire 3 bent to form a succession of loops, coiled about said rod at intervals, with each loop projecting from one face of the concrete body to form a series of eyes 3a, said rods, loops and eyes lying in the same vertical plane, substantially as described.

803,865. Cement-Block Machine. Daniel W. Weller, Phoenixville, Pa. Filed June 21, 1905. Serial No. 266,202.

Claim.—A machine for making hollow cement blocks comprising a frame, a pivotally-mounted and evenly-balanced body, a forming-box composed of movable members, carried by said pivoted body, cores adapted to enter said box from the rear, a rack formed on each of said cores, a gear-wheel engaging said rack, a four-armed crank pivoted centrally at the rear of the box, four adjustable screw rods 8 connected at one end to said crank and at the other end one to each of the four movable box members, a hand operating-lever secured to said crank and adapted to turn said crank and thereby open and close the said box members simultaneously, and a truck, mounted on a track formed on said frame, adapted to receive the contents of said box, substantially as described.



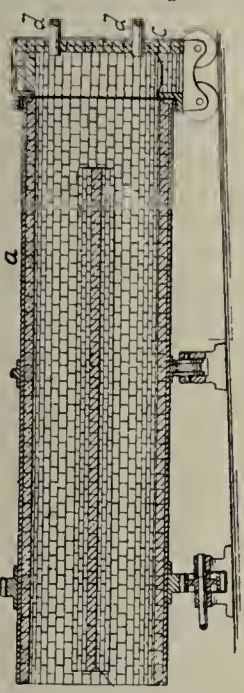
804,041. Building-Block Mold. William Porten, St. Paul, Minn. Filed Apr. 24, 1905. Serial No. 257,036.



Claim.—1. In a mold for building-blocks, the combination, with a frame, of a vertically-movable core-support and means for operating the same, and means for temporarily clamping a core on said support and means for automatically returning said clamping means to its unclamped or inoperative position, substantially as described.

804,076. Rotary Kiln. William R. Warren, New York, N. Y. Filed May 2, 1905. Serial No. 258,545.

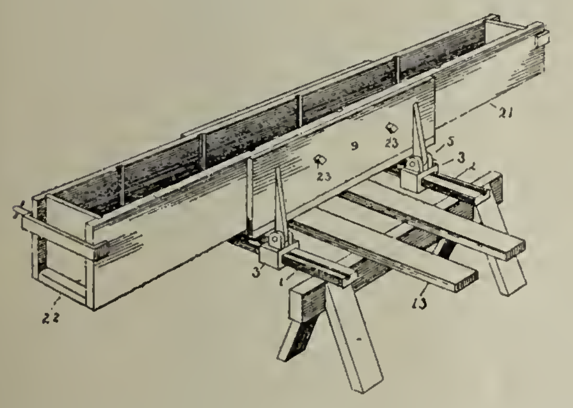
Claim.—1. A kiln of suitable shape in cross-section and provided with one or more partitions extended longitudinally through the kiln to divide the same into compartments and a fuel-inlet common to both compartments.



2. A rotary kiln provided with a partition placed diametrically in the kiln and made to terminate short of each end of the kiln and a fuel-inlet common simultaneously to the compartments formed by said partition.

805,457. Adjustable Mold for Making Building Blocks. Joseph B. Francisco, Columbus, Ohio. Filed Apr. 24, 1905. Serial No. 257,131.

Claim.—1. In a mold for building-blocks, the combination of a receptacle for molding a part of the block and a cover with flanged apertures for molding the remainder of the block, substantially as described.



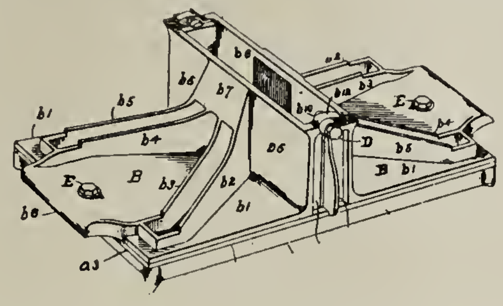
2. In a mold for artificial-stone blocks, in combination with a mold for the face of such block, a plate adapted to fit thereon having walled apertures adapted to receive and mold the material for the back of the block, substantially as described.

3. In a mold for ribbed building-blocks, the combination of a tray for molding the tabular part of the block and an apertured rib-form fitting thereon for molding the back of the block, substantially as described.

4. In a mold for making ribbed and similar slab building-blocks, the combination of a tray part for molding the slab parts of said block and parts hinged together and having flanged apertures adapted to fit over and mold projections on the back of said slab part of block, substantially as described.

804,122. Mold for Building-Blocks. Charles J. W. Hayes, Detroit, Mich. Filed Mar. 13, 1905. Serial No. 249,699.

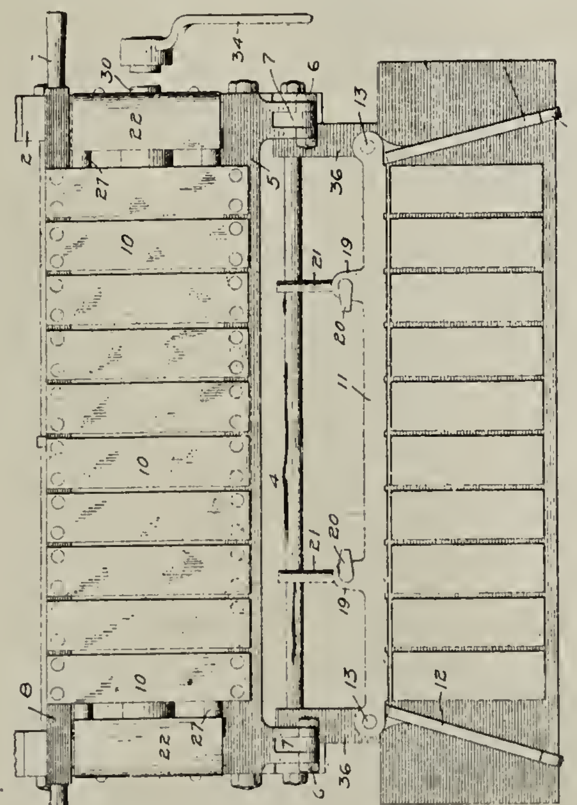
Claim.—1. A mold for the manufacture of concrete building-blocks, having a bottom supported by rockers, having arms secured to said bottom on which the side plates are slidably hinged, substantially as set forth.



2. A mold for the manufacture of concrete building-blocks having a bottom supported by a rocker, arms attached to said bottom; sides slidably hinged to said arms, and false sides secured to said side plates; false bottom 22 secured to bottom 7, substantially as set forth.

804,169. Mold for Building-Brick. William Porten, St. Paul, Minn. Filed July 17, 1905. Serial No. 270,005.

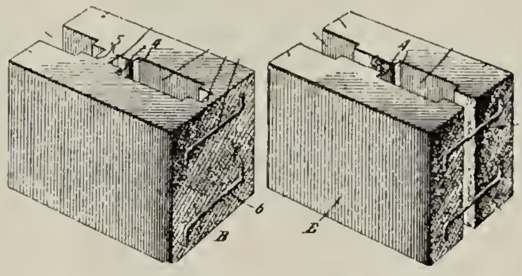
Claim.—1. The combination, with a frame, of a mold hinged thereon at one side and adapted to be swung on its hinges to an inverted position, and having suitable handles, means for supporting said mold in its inverted position, said mold having a floor composed of a series of smooth-surfaced plates spaced apart, and partitions separating said plates one from another, said partitions being movable from between the plates to permit the mold to be swung on its hinges, substantially as described.



2. The combination, with a frame, of a mold composed of side bars, one of them hinged to said frame and the other having suitable handles, smooth-surfaced plates arranged parallel to one another at intervals and having their ends secured to said bars and forming the floor of the mold and capable of swinging with the hinged portion of the mold, partitions fitting between said plates, and walls removably mounted on said bars and plates, substantially as described.

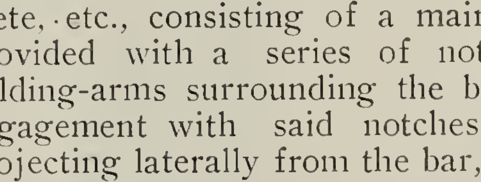
805,478. Concrete Building-Block. Edgar L. Lorscheider, Chicago, Ill. Filed Feb. 16, 1905. Serial No. 245,867.

Claim.—1. A concrete building-block comprising sections connected by readily-destructible webs and by permanent ties serving to maintain the rigidity of the block after the connecting-webs have been destroyed, substantially as described.



805,663. Reinforcing Device for Concrete Construction. George L. Peabody, Pittsburg, Pa. Filed Sept. 29, 1904. Serial No. 226,528.

Claim.—1. A reinforcing device for concrete, etc., consisting of a main bar provided with a series of notches and holding-arms surrounding the bar in engagement with said notches and projecting laterally from the bar, substantially as set forth.

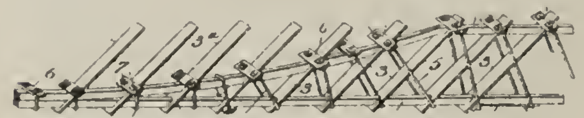


2. A reinforcing device for concrete, etc., consisting of a main bar provided with a series of notches, holding-arms surrounding the bar in engagement with said notches and projecting laterally from the bar, with securing devices for the arms, substantially as set forth.

805,762. Framework for Cement Structures. John S. Thomas and William M. Thomas, St. Louis, Mo. Filed Oct. 13, 1904. Serial No. 228,333.

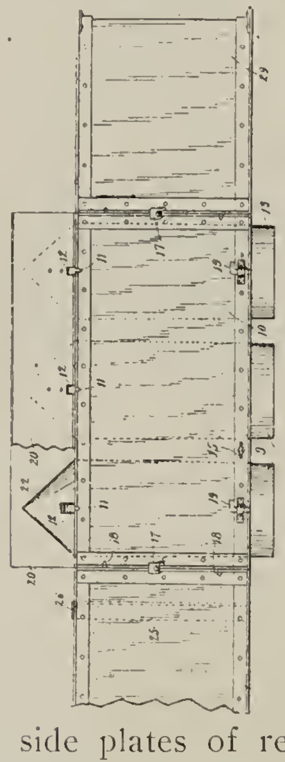
Claim.—1. In a framework of the character described, the combination of a pair of beams, apertured struts threaded thereonto and disposed in positions oblique to the beams, and ties connecting said beams and struts, substantially as set forth.

2. In a framework of the character described, the combination of a pair of beams, apertured struts threaded thereonto and disposed in positions oblique to the beams, and ties connecting said beams; said ties being arranged to embrace said struts at the outer faces of said beams, substantially as set forth.



805,819. Mold for Concrete Walls. August F. Reichert, Milwaukee, Wis., assignor of one-half to Richard C. Ferge, Milwaukee, Wis. Filed Apr. 20, 1905. Serial No. 250,688.

Claim.—1. A mold for concrete walls, comprising mold-sections formed of side plates of rectangular angle-iron-frame construction, screws passed through the side plates near their lower ends, a tie-plate with which the screws are adapted to engage, and a stay-rod connecting the side plates near their upper edges to properly space them apart, said screws serving to hold the side plates in position on the wall to form a support for other side plates thereabove.

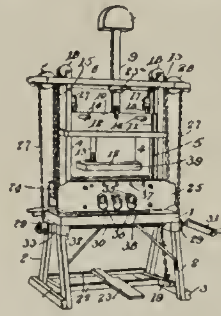


2. A mold for concrete walls, comprising opposite side plates of rectangular angle-iron-frame construction, means for connecting the side plates together near their lower edges, and a stay-rod having an adjustable pin-and-perforation connection with the outstanding flanges of the frames of the side plates.

3. A mold for concrete walls, comprising opposite side plates of sheet-metal and rectangular angle-iron-frame construction, a tie-rod consisting of a strip of metal with its ends folded back, thumb-screws passing through the side plates and threaded in the bent-over ends of the tie-rod, and a stay-rod having a series of pins to adjustably engage with perforations in the upper flanges of the side plates.

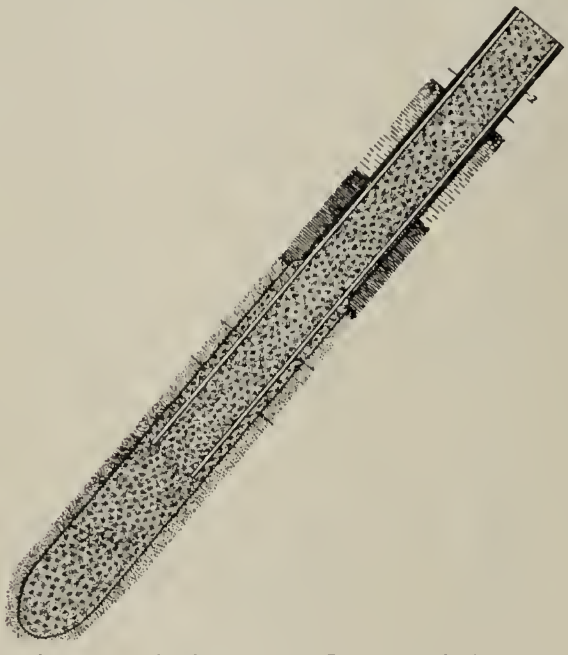
805,914. Machine for making Cement or Concrete Blocks. Jacob Horr, Mechanicsburg, Ohio. Filed June 8, 1905. Serial No. 264,214.

Claim.—1. A machine for making cement blocks, comprising a supporting-table provided with vertical guideways, a permanent mold-body mounted on said guideways, means for raising and lowering said mold-body and holding it in a raised position, a tamping-plunger vertically movable in said guideways and provided with a top plate adapted to enter and fit the mold-body, means for reciprocating said tamping-plunger, and means for locking said tamping-plunger against vertical movement in either direction at different points of its path, substantially as described.



805,936. Concrete Pile and Method of Making the Same. Frank Shuman, Philadelphia, Pa. Filed Jan. 9, 1905. Serial No. 240,289.

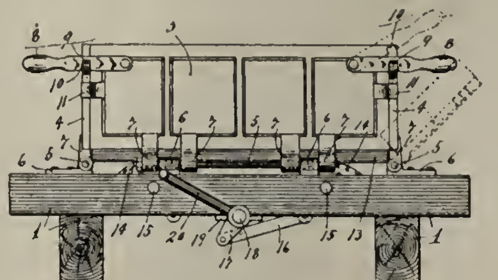
Claim.—1. The mode herein described of making a concrete pile, said mode consisting in first driving or sinking a preparatory pile, then withdrawing the same and introducing concrete into the opening formed thereby, and, before or during such introduction of the concrete, inserting a metallic reinforce into the opening, substantially as specified.



3. The mode herein described of forming a concrete pile, said mode consisting in first driving into the ground a hollow preparatory pile having a movable point, then slowly or intermittently withdrawing said preparatory pile, and, during such withdrawal, introducing concrete into the opening formed thereby, and, before or during the introduction of the concrete, inserting a metallic reinforce into the opening, substantially as specified.

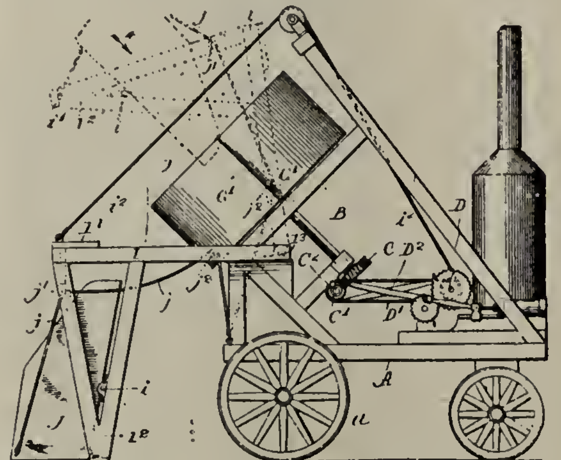
804,240. Flask for Molding Concrete Blocks. Thomas Libby, Minneapolis, Minn., assignor of one-half to Nels W. Nelson, Minneapolis, Minn. Filed Aug. 20, 1904. Serial No. 221,454.

Claim.—A flask, having its sides and ends hinged near the bottom of the flask, and adapted to be turned outward, and locks at four corners of said flask connecting said sides and ends, each lock involving a notched lug 9 on one of the hinged members, and a co-operating notched lever 8 10 on the abutting hinged member, together with stop-lugs 11, that engage the ends of said abutting hinged member, substantially as described.



804,261. Concrete-Mixer. John W. Page, Chicago, Ill. Filed Jan. 20, 1904. Serial No. 189,793.

Claim.—1. In a device of the class described, the combination with a suitable framework, of a mixing-chamber supported thereby and rotatable upon an inclined axis, a swinging frame pivoted to the framework below the chamber and adapted to be swung into position above the same, a scoop pivoted to the swinging frame, means for moving the swinging frame about its pivot, and means for automatically swinging the scoop upon its pivot on the frame to dump the contents of the scoop into the mixing-chamber as the swinging frame is raised.



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George J. Grant
CONTRACTOR.
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October 5, 1905

Marquette Cement Manufacturing Co.
Marquette Building, Chicago

Gentlemen:-

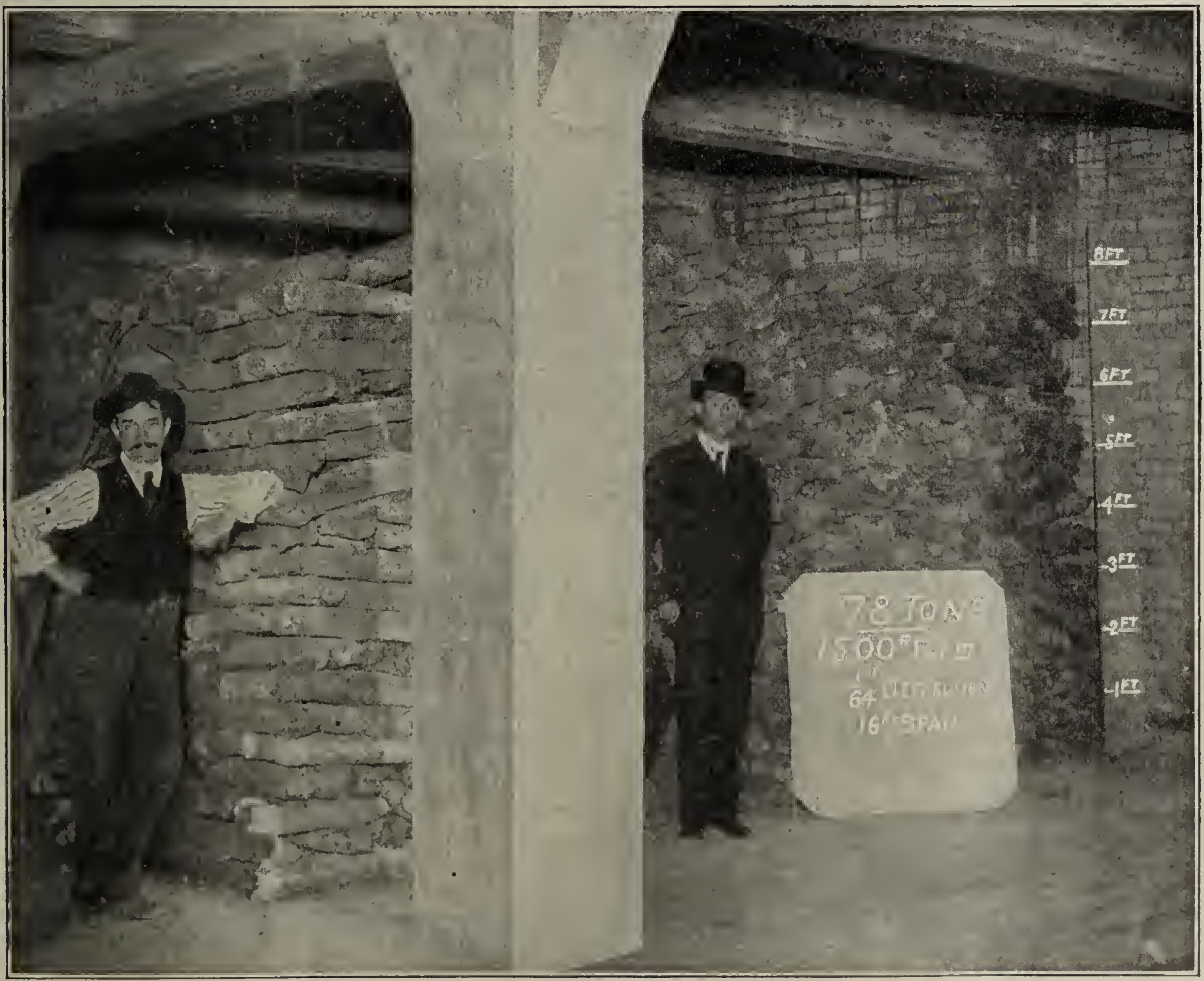
The second test on the floor of the Farwell, Ozmun, Kirk & Co. warehouse in this city was made last month. The size of the panel tested was 13' x 16' upon which we placed 78 tons pig iron on the center of the pannel. The space covered by the pig iron was 6 1/2' x 16' which is equal to 1,500 pounds to the square foot.

The panel when tested was 90 days old and the deflection was 1/64 of one inch.

The panel was constructed with Marquette Portland Cement and I must congratulate you on the quality of cement you are making.

I enclose a photograph of the test.

Yours truly, Geo J Grant



25,000 BARRELS MARQUETTE PORTLAND CEMENT USED IN THIS BUILDING

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

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GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

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AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

POSITION WANTED.

A thoroughly practical cement chemist is open for engagement. Technical training and mill experience. Address Box A. O., CEMENT AND ENGINEERING NEWS.

POSITION WANTED—Technical cement chemist and engineer of the broadest experience in cement manufacture, desires position. Address "Experience," care of CEMENT & ENGINEERING NEWS.

CEMENT CHEMIST

Five years' experience on both wet and dry process with marl, limestone, clay and shale, desires position. Address "W. L.," care of CEMENT AND ENGINEERING NEWS.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

WANTED

Position as Chemist after January 1, 1905. Have had five years' experience as Chief Chemist of one of the largest and most up-to-date cement mills in the United States. Best of experience furnished. Address "A. B. C.," care CEMENT AND ENGINEERING NEWS.

WANTED

CEMENT CHEMIST, with seven years' experience in Germany and this country. Familiar with dry and wet process, desires change. Address M. G. 30, care Cement and Engineering News.

WANTED—Position as Superintendent or Constructing Engineer. Graduate M. E. with several years' experience in design, construction and operation of wet and dry process cement plants. Now superintendent of plant. Open for position after January 1st. Best recommendations from former employers. Address "Superintendent," care Cement and Engineering News.

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Agency for a reliable Portland cement, for Chicago and vicinity, by parties in touch with leading contractors and cement consumers. Address "B. & B," care of CEMENT AND ENGINEERING NEWS.

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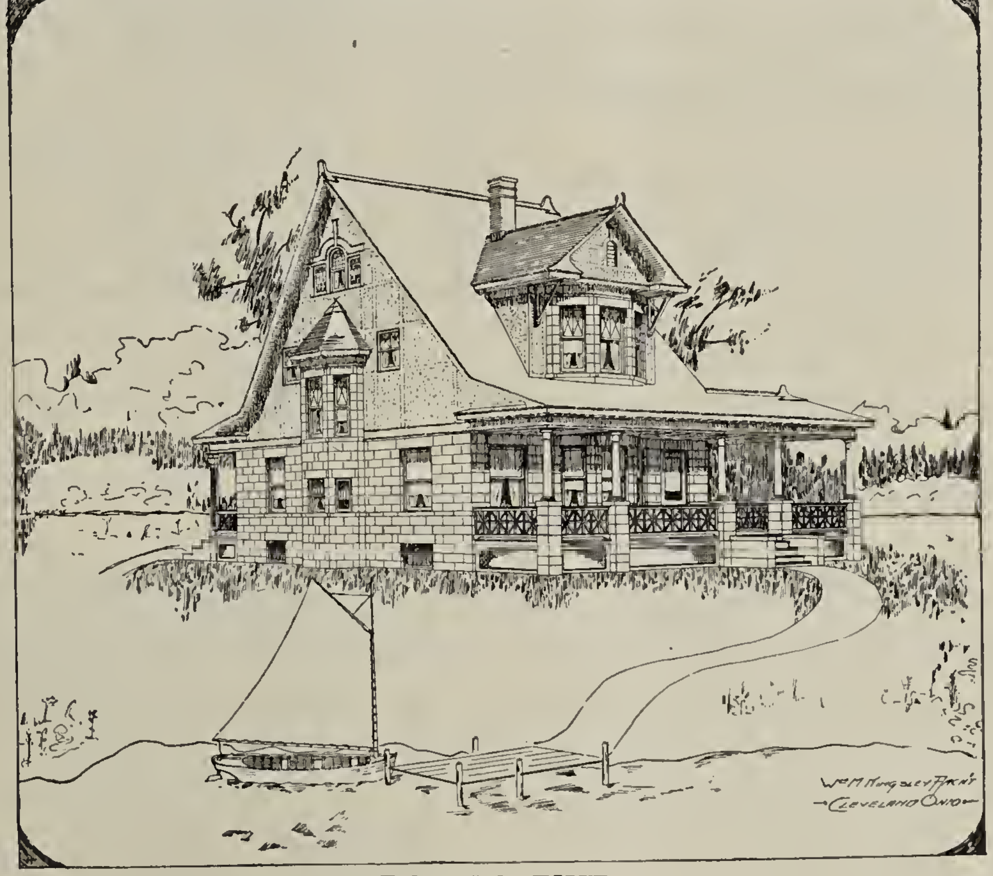

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WANTED—A position as Assistant Chemist. One year's experience on dry process. Good references. Address R. E. R., care CEMENT & ENGINEERING NEWS.

HEAD BURNER, with good experience in both wet and dry processes, desires to change position on January 1st, 1906. First-class references furnished. Address T. J. G., Alsen, Green Co., New York.

REQUIRED—Prices f. o. b., Atlantic port, and literature for plant and machinery for equipment of 1,200 barrel per week Portland Cement Factory abroad. Address A. O. VINCENT, Richmond Rd., Stechford, Birmingham, Eng.

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Bridges, Buildings,
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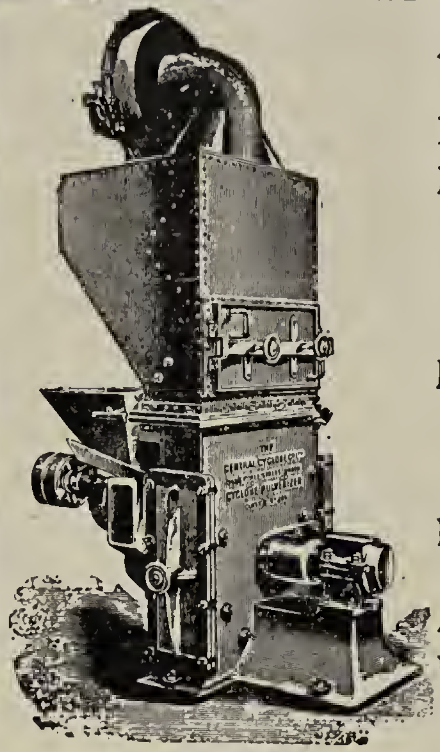

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Nothing to Clog, Break,

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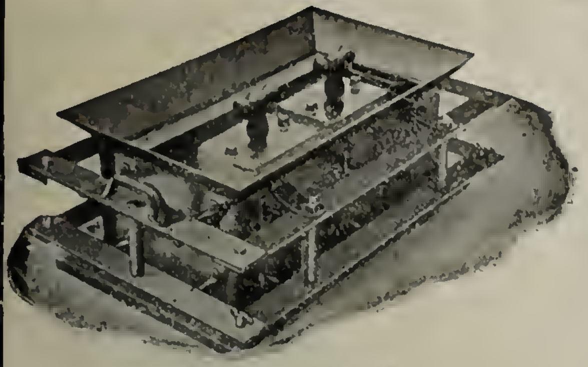

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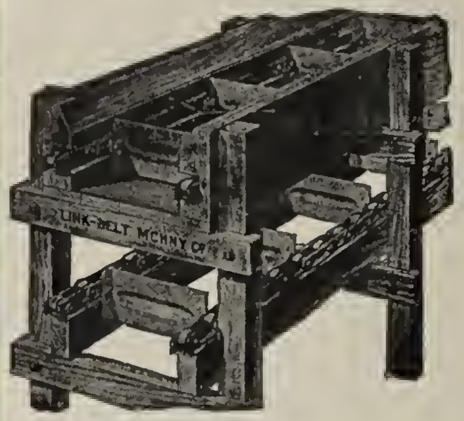

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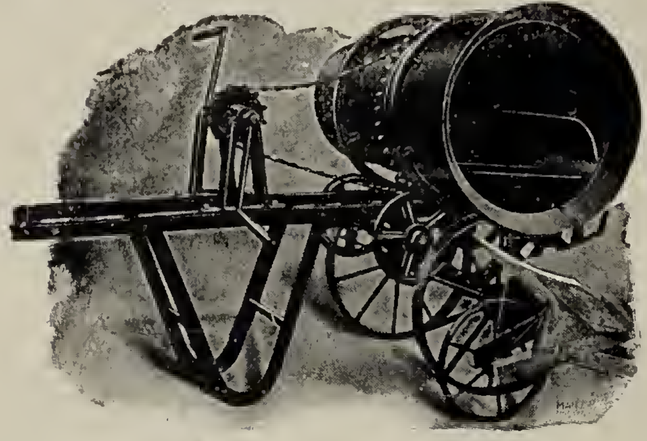

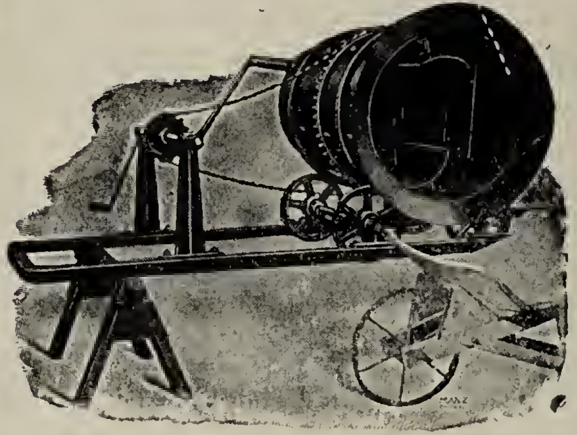

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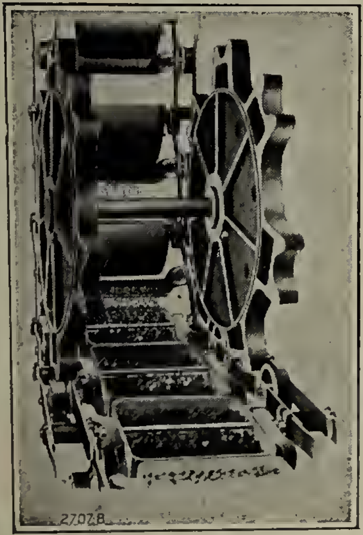

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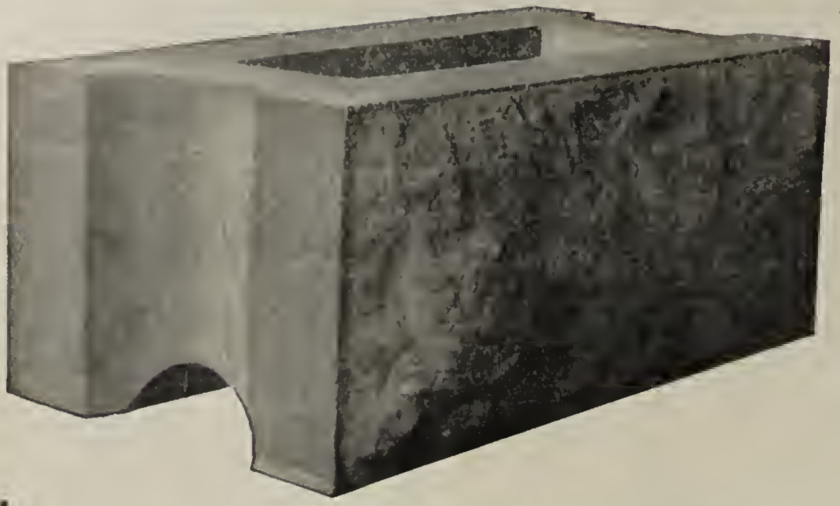

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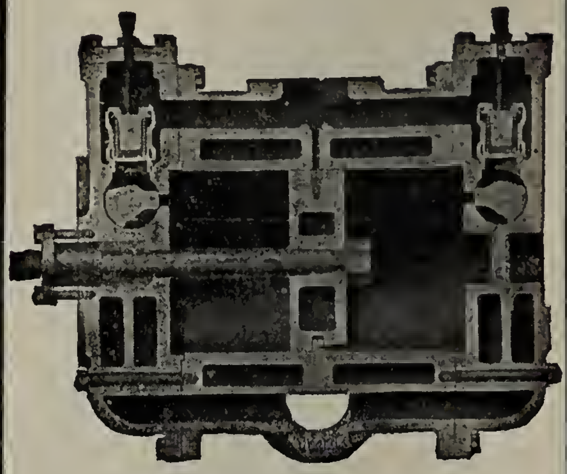

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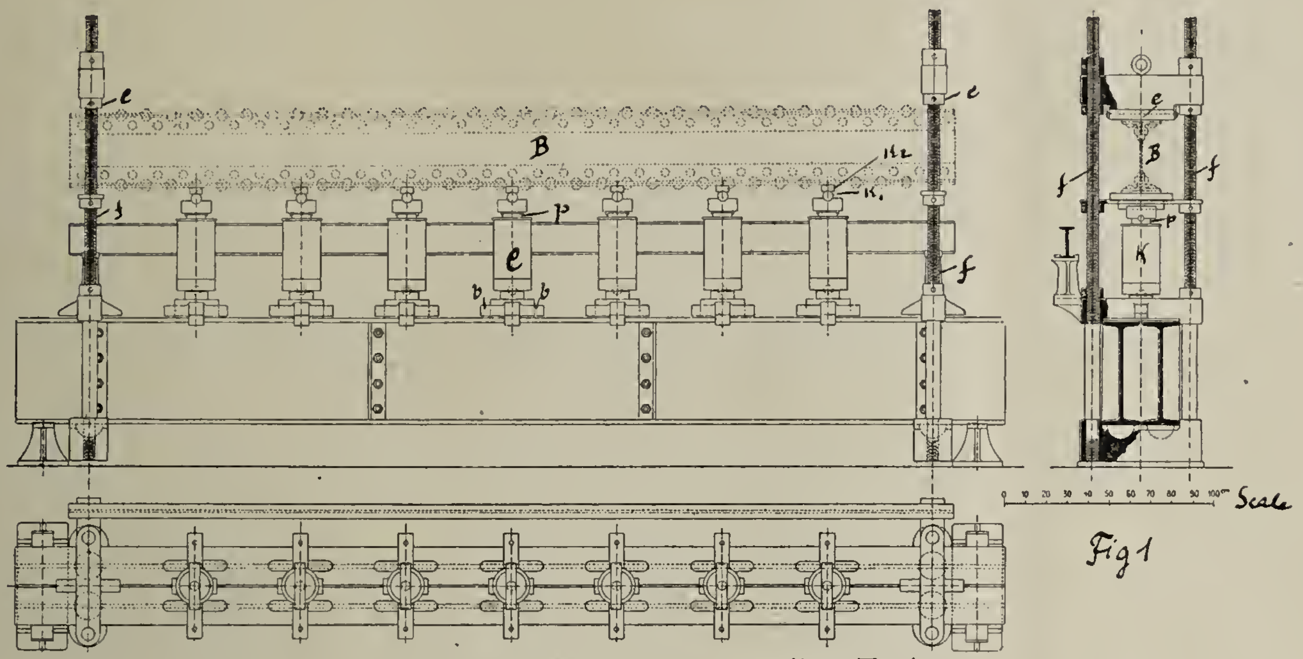
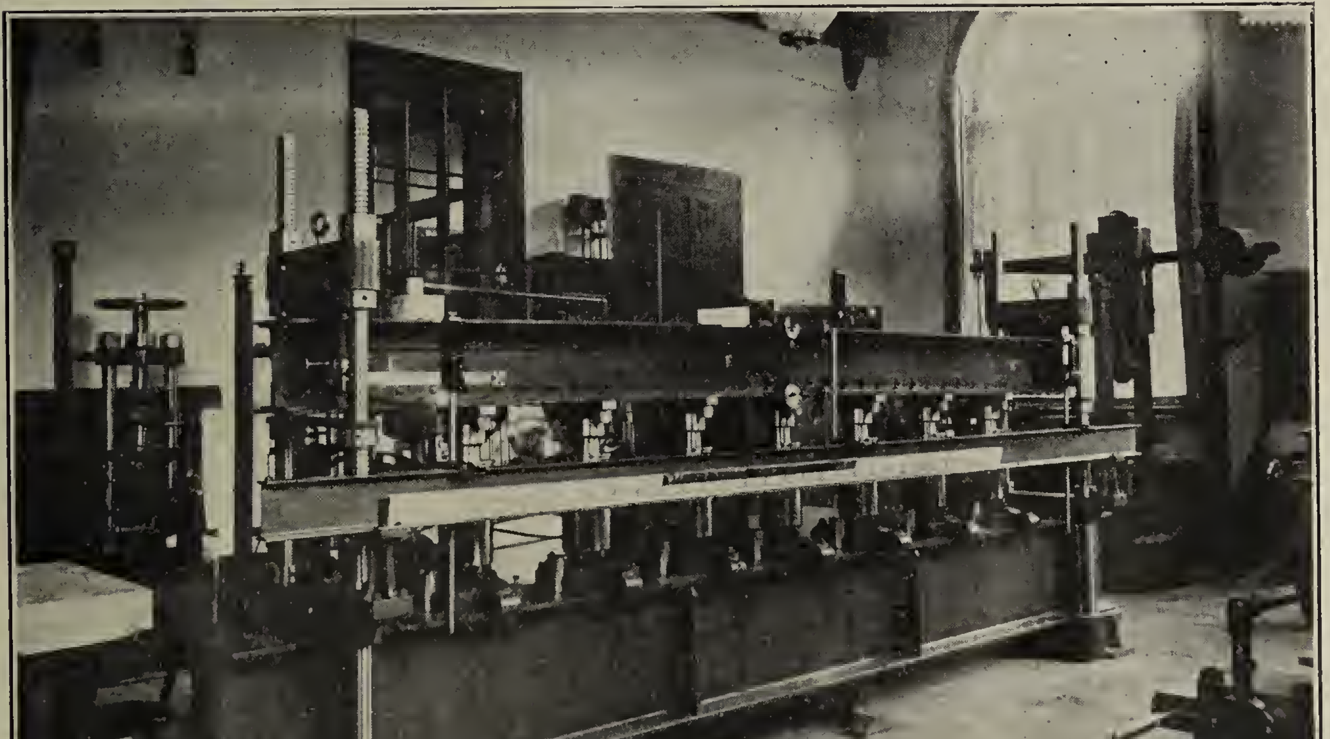


Details of Machine for Bending Test.



Machine for Bending Tests Used by Institute for Testing Materials, Zurich.
See page 3 for description.

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CHICAGO, JANUARY, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE NATIONAL ASSOCIATION OF CEMENT USERS.

The attendance at the Milwaukee meeting of the National Association of Cement Users exceeded expectations, notwithstanding the confusion resulting from attempting to change the place of meeting to Columbus, O.

There was a strong feeling in the convention that the executive board was reaching out for too much authority, that the rights of individual members were being narrowed down to paying dues only. While this is in a measure true, it is likewise a fact that men who give their time and money to make an organization a success should be invested with ample power, subject, however, to the approval of the convention at all times. The delay in publishing the proceedings of the previous convention was not relished by a majority of the members. There is likewise a feeling that the secretary has been invested with the entire power and authority of the executive board; in short, that the secretary is the whole thing. These impressions should be removed in order to insure harmony in the future.

The exhibits and papers read during the four days' session were all that could be expected. Machine men report numerous sales.

The convention by vote favored Chicago as the place of the meeting for 1907. Jackson, Michigan, citizens, made the most business-like proposition and cash inducement to secure the convention. Mr. Treat of Chicago gave scant courtesy to the Jackson proposition. As a result Jackson will have a convention of its own on March 7 and 8 of the present year.

THE NORTHWESTERN CEMENT PRODUCTS CONVENTION.

The second annual convention of the Northwestern Cement Products Association was held at Minneapolis on Jan. 17, 18 and 19. The convention hall as well as the exhibition space were both overcrowded, all going to show that the great Northwest is pushing ahead in concrete construction.

Hourly trips from the convention hall were made to the extensive works of the Miracle Press Stone Co., where the process of manufacture of the company's numerous concrete machinery specialties were under way. The association will hold its next convention at St. Paul.

ELECTION OF OFFICERS.

The Standard Portland Cement Company, works at Napa Junction, Cal., offices Crocker building, San Francisco, Cal. The following officers were chosen at the annual election Jan. 18, 1906: Irving A. Bochman, president; William F. Dingee, vice president; Frank A. Losh, secretary.

Provision for doubling the present capacity of the Napa Junction plant was made.

The Portland Cement Company of Colorado at its annual meeting at Pueblo January 11 elected the following officers: President, Chas. Boettcher, Denver; vice president and treasurer, M. D. Thatcher, Pueblo; general manager, Whitney Newton, Pueblo; board of directors, Messrs. James and Sullivan, Denver; Boettcher, Thatcher, Newton, Pueblo; H. Leonard, Los Angeles, Cal.; and Charles E. Gast, Pueblo. The capacity of the plant is to be increased to 2,000 barrels per day, the present capacity being 1,200 barrels per day.

The White Portland Cement Company is to be sold April 2 under a decree of the U. S. court to satisfy a mechanics' lien of $6,500 in favor of the Hill Clutch Company of Cleveland, Ohio, and the Buffalo Forge Company of Buffalo, N. Y.

The Alberta Portland Cement Company, now under construction at Calgary, Alberta, is making good progress with its buildings and expects to be in the market with its product June 1 of the present year.

The Consolidated Railroad Cement Corporation has been formed to establish a cement plant at Rapid City, S. D. A plant of 350 barrels daily capacity is projected.

The Iola Portland Cement Company is the heaviest tax payer in Allen county, Kansas, having paid $13,350 on its Allen county holdings.

The American Cement Company declared a 6 per cent dividend for 1905. The surplus after meeting fixed charges was not quite sufficient to meet the 6 per cent dividend, therefore the surplus from previous earnings was drawn upon to make up the deficiency. One million three hundred and twenty thousand six hundred and forty-three barrels were produced in 1905 against 1,220,540 barrels in 1904. While more cement was sold in 1905 than in the previous year, low prevailing prices caused a falling off in net profits.

The Perubina Portland Cement Company, works at Milford, Perubina county, N. D., will enlarge its plant to 500 barrels per day. Shaft kilns are used. The product is a high grade natural rock, conveying 5 per cent less lime than true Portland cement. The company has under consideration a twenty-one mile road of standard gauge to the nearest shipping point.

Agreements were signed on Dec. 30, 1905, for the construction of a Portland cement plant at Mason City, Iowa.

HAND CONCRETE MIXERS.

The Miracle Pressed Stone Company of Minneapolis, Minn., has brought out a cube concrete mixer operated by hand power. Simple in design, there being no screws or paddles to clog or interfere with the mixing, it works easily by hand and does thorough work with a minimum of power, and is especially adapted for small cement users requiring the high grade mixing. Power can be easily applied to this mixer for large users. It occupies less space than usual for its capacity, compared with many other machines. We understand the price is very reasonable. Full particulars can be obtained by addressing as above.

IOWA CEMENT USERS' CONVENTION

The Iowa Association of Cement Users will hold its second annual convention at Ames, Iowa, Feb. 8 and 9, 1906. An extensive program is being arranged and provisions for exhibition of machinery, cement and cement products at the state college grounds are under way. A large attendance is expected at the coming meeting.

The engineering faculty of the college will take active part in the proceedings of the convention.

The Chicago & Northwestern Railway will make special rates for the convention.

CONVENTION NOTICES.

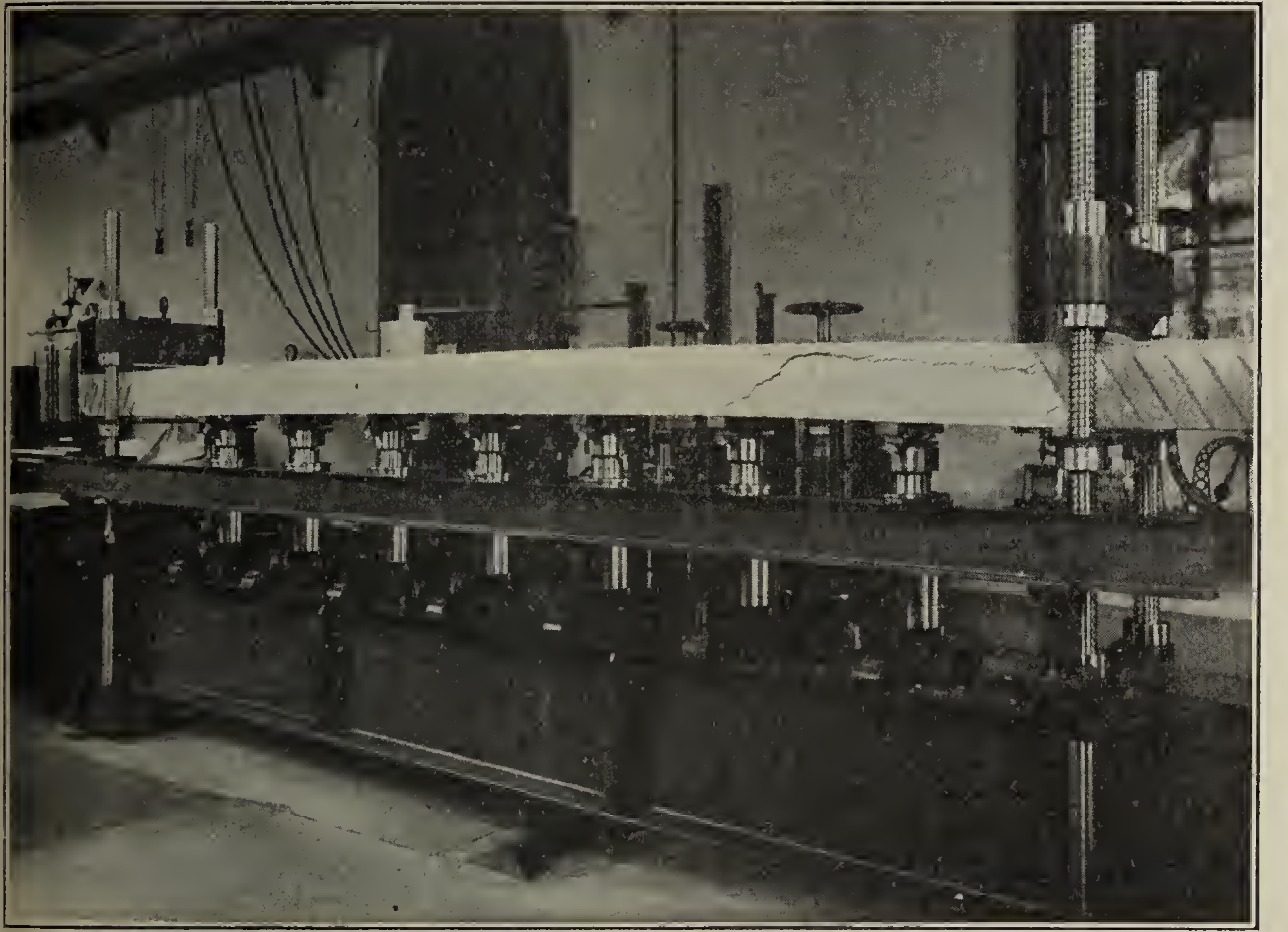
Iowa Cement Users' Association, February 8 and 9, at Ames, Iowa.

A NEW MACHINE FOR BENDING TESTS.

E. Probst, C. E., Zurich.

The ever increasing importance in the last few years of the testing of building materials and building constructions and especially of the experiments which have taken so prominent a place since the introduction of reinforced concrete, has given rise to a number of more or less successful testing machines. One of these I wish to describe.

For three years it has been in use in the institute for the testing of materials in Zurich, having been built in accordance with the ideas of Prof. Schuels by the engineers, Amsler-Laffon, in Schaffhausen, and which combines extraordinary simplicity and precision with a number of other advantages over former machines for bending test.



Bending Test Machine Used by the Institute for Testing Materials, Zurich.

It should not be left unnoticed that the machine owes its origin to the working out of the Swiss normals for concrete and reinforced concrete and that the first incitement to the building of this machine was given at the beginning of the work of the commission chosen for these experiments, as it was not possible to obtain accurate results with existing machines.

Former machines consist for the most part of an apparatus which causes a concentrated load to work in the middle of a beam of such a kind that the beam under experiment is bent little by little till a breaking of the beam or a sinking of the load sets in on account of excessive bending or flowing of the material. The concentrated load is caused by a stamp, which also dispose of this defect in bending tests was made by substituting for the middle edge two edges symmetrical to the middle, which exercise equal forces on the beam to be tested by means of balance arms. This yields a piece between the two edges advantageous for the measurement of the strains in consequence of the moments of bending remaining equal between these two points. The machine in discussion working at the Swiss testing institute carries out the experiment in such a manner that it causes an equally distributed load. The most important components of this machine are has the effect that the beam is held fast at the points of the support and the point where the concentrated load works. This is therefore not a perfectly free support. An experiment to schematically described in Fig. 1.

The load is exercised by seven pistons with a variable distance from center to center; but fifty meters is advantageously to be chosen, as in the experiments at the institute, as in this manner the equally distributed load per running meter is obtained by doubling the load working in one point. Pistons without stuffing or friction are used as loads by means of pressure. Every press is provided at the bottom with a steel sphere; above are two tipping apparati k_1 k_2.

It is evident that each cylinder c will only exercise a force in its axis but that there is no sure support of the beam under experiment at the point of contact with the load. By raising the load the beam is therefore assigned to its own stiffness against breaking on side. The presses p are driven with ricinus oil. Before the commencement of the experiment the pistons k must be placed exactly vertical, which is made possible by each cylinder having underneath four bolts fitted with spiral springs. A pump driven by hand or motor and connected by communicating pipes with the separate cylinders causes the raising and sinking of the pistons. The load is read off from scales by means of mercury columns. Each machine possesses two scales, one up to 3 tons, the other to 18 tons pro-press, so that a load of 126 tons can be produced by this machine.

The supporting of the beams is performed by edges e, which are fitted in frames f, which in its turn swings on its lowest part, which has the result, that the changes of strain in the fibers, supported at the ends, remain without influence on the inner strains.

How is the experiment carried out with such a machine? The beam B to be tested is with great accuracy placed in such a position that all the forces can work exactly in the center plane M of the beam. Unless this is carried out with great precision, it is noticeable shortly after the beginning of the loading in the distortion of the beam. After placing the beam in position on the cylinders c the axis of the body will fall in a vertical plane with that of the cylinder; the center line of the two edges must also fall in this vertical plane. The placing of the beam in the above given manner must be performed with the greatest care, in order to obtain exact results. Instruments for measuring the bending are applied in the middle and at both ends, and the actual bending in the middle is the difference of the middle reading and the arithmetical mean of the readings at the two points of support. The other arrangement for measuring the strains in certain parts of the beam are the same as for othe machines. By the raising of the pis tons, which is controlled according t a scale, the load is brought into a tion. The experiment can be carrie on so far that a very large bendin takes place. Absolute is very seldo arrived at by the machine but this i quite irrelevant in beams under th influence of bending, since the question is to discover the stiffness of the beam and not the breaking point. In our case the span of the machine is 4 meter; the length of the beams to be tested can therefore be 4.30 m. By laying the beams on the pistons, without laying the beam upon the edges, the weight of the beam may be determined with fair accuracy, a distinct advantage, when large, heavy beams are in use.

This machine is as applicable in practice as well as in laboratories and has the great advantage that bodies of large dimensions can be tested and that the load can be made to rise and sink in rapid succession, which is specially useful in determining the changes of strain by often repeated loading. The load which is equally distributed over the whole length of the beam by the pistons, has as a result that the deformations and changes of strain of the whole body can be observed, a fact of special importance in testing of reinforced concrete.

Formerly tests have been made with the machine on rolled and riveted girders, as shown in Fig. 2. On this picture the measuring arrangements in the middle and at the points of support as well as the measures for the strains are visible. Tests were also made on Siegwart beams (artificial constructed beams of reinforced concrete; see Fig. 3).

At the present time, the machine is being used for the performance of scientific tests with reinforced concrete, according to the rules of the Swiss Commission.

FORMS FOR ORNAMENTAL CONCRETE.

Numerous methods have been devised for producing ornamental concrete stone. When properly made and thoroughly cured it may be cut to any shape or ornamental design by a stone cutter or sculptor. On account of its plastic nature before setting, it may be readily molded into any form desired.

The Germans have employed both methods with success during the past forty years, as was shown by the erec- of the large cement building at the icago world's fair in 1893, known Das Deutsche Haus, constructed ntirely of Portland cement concrete, ncluding the statuary and ornaments.

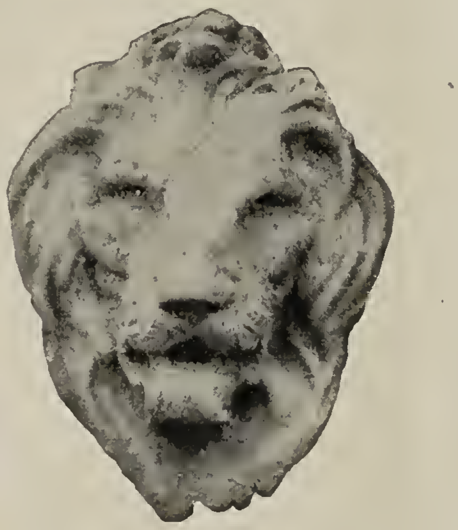


Fig. 1.

The following are methods of producing ornamental stone in this country:

First, the gelatine or glue mold process, the finest examples of ancient and modern sculptures being reproduced in plaster of Paris, yet when applied to reproducing the same class of work in Portland cement concrete, the glue mold rapidly deteriorates and fails.

Casting in sand molds is another method of producing ornamental concrete forms; the concrete or mortar is poured, like moulten iron, in the sand, fully 65 per cent of water being carried in the mixture. It requires considerable practice to do this class of work. Even under-cut work may be produced by this method.

Plaster of Paris molds are likewise employed for plain and under-cut work. In the latter case the plaster mold must be destroyed in recovering the cast.

The average builder wants a cheap, practical mold that will produce good, sound work at a small cost.

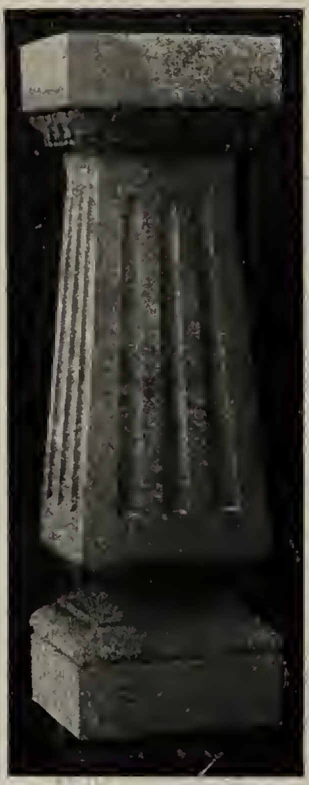


Fig. 6.

Fig. 1, a lion's head cast in concrete, in a flexible rubber mold, producing under-cut work. These molds are durable and can be used repeatedly. While the first cost is high, they are nevertheless economical where many pieces are required from the same mold. The writer finds excellent effects may be produced without undercutting in architectural designs by the use of metal patterns or molds, the rough castings being cleaned by sand blast to a clean, smooth face such as is presented in stove plate castings. Illustrations 2, 3, 4, 5, 6, and 7 the process of manufacture is as simple as making concrete blocks. The Cement Working Machinery Company of Detroit, Mich., is making a specialty of these metal forms.

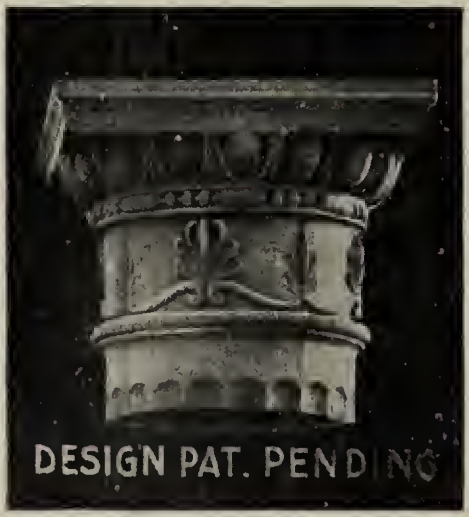


Fig. 3.

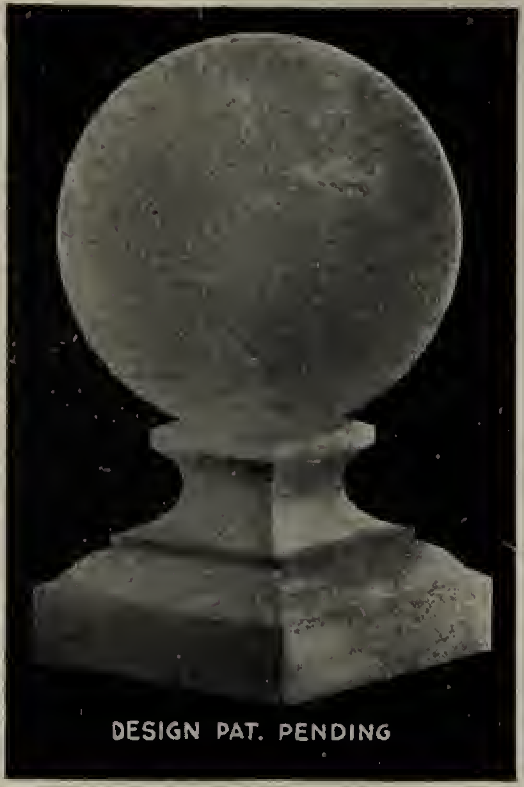


Fig. 4.

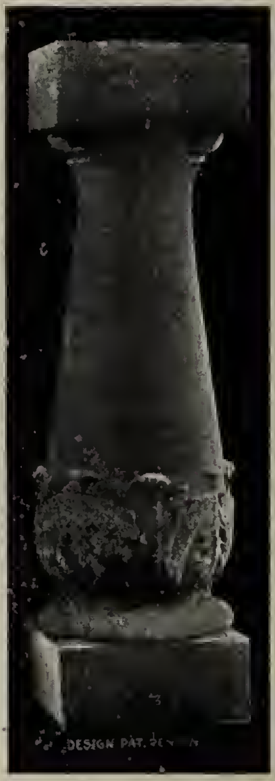


Fig. 2.

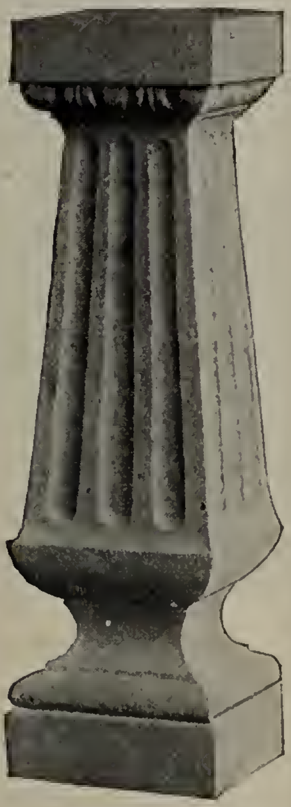


Fig. 5.

Among the contracts that the firm of F. L. Smidth & Co., cement engineers and makers of cement machinery, 41 Cortlandt street, New York, have recently taken is one for seventeen of their large size tube mills for the Pacific Portland Cement Company, Cement, Cal., and another one for twenty-four Kominuters and tube mills for the new plant at Fogelsville, Lehigh county, Pa., of the Lehigh Portland Cement Company. Three additional Kominuters are now being installed at the mill "B" of the Lehigh company.

THE SELECTION OF PORTLAND CEMENT TO BE USED IN THE MANUFACTURE OF CONCRETE BLOCKS.

By Richard K. Meade, Chief Chemist of the Dexter Portland Cement Co., Nazareth, Pa.

In every new industry there are some successes and many failures. The concrete block industry has been more fortunate than most new industries, in that a heavy demand for building materials of all kinds has made the number of failures less than the number of successes. Whether this condition will last will depend entirely upon the class of work done by the present generation of concrete block manufacturers. If their work is good, if their product proves sightly and buildings made of it turn out to be enduring and sanitary, the failures of the future will be few, and will depend wholly upon a disregard of the law of supply and demand; or an ignorance of the business. If the work of the present generation is poor, if buildings built of its product are unsightly, damp and given to decay and ruin, the failures of the future will be many and will of course be directly attributable to the poor work of the present day manufacturers.

A general impression seems to prevail that sand is of many grades and must be carefully selected to give a block of good color and the requisite strength. Likewise, that each make of concrete-block machine possesses features peculiar to itself which will add to the economy with which the factory can be run or the quality of its output. Portland cement, however, is thought to be Portland cement, and like Caesar's wife, to be beyond reproach.

One brand is often considered as good as the other, and the whole matter of selection often turns on a difference in price of a few cents a barrel. A sales agent for a large cement plant recently said to me, "My friend, there is no such a thing as *bad* Portland cement." which was another way of saying that "there is a sucker born every minute," and if a cement is not good enough for the careful purchaser who tests his purchase it can readily be worked off on the careless man who does not.

The concrete block manufacturer needs the best of cement, and the future of his business will depend upon his getting this. If he allows his warehouse to become the dumping ground for cement rejected for such heavy, rough undertakings as piers, abutments, foundations, etc., how can he expect the finer and more exacting class of work which he does to last?

It is the purpose of this paper to point out the properties most requisite in Portland cement to be used for the manufacture of concrete blocks. Three all important qualities of the latter will be dependent upon the cement of which they are made; two of them will be entirely dependent upon it and the third to some extent. These properties are: (1) Endurance, (2) strength, (3) color.

The endurance of the block is of course an important property, as it makes little difference what strength the building may have when made if in a short time it is to disintegrate. The strength of the block, however, should be such that it will withstand all stresses, strains, and loads which may be applied to it, either in the laying of it in the wall or after it is in position and the building completed. The color of the block affects its market ability for superstructure work.

To take up the way of attaining these qualities in detail we will first turn our attention to endurance.

ENDURANCE.

To manufacture concrete blocks which will retain their strength in spite of the disintegrating action of time, water, and the gases of the atmosphere, a "volume constant" or "sound" Portland Cement must be used. What causes certain cements to swell and expand after mixing with water and allowing them to harden is not certainly known. Those conditions surrounding the manufacture of cement which give it this tendency are well understood, however, and are usually improper proportioning of the raw material (allowing the lime to be in excess over the silica and alumina) and insufficient grinding and burning of the mixture. This has led most cement investigators to attribute disintegration to an excess of "free lime." This free lime is locked up in a case of hard cement clinker and is almost as effectually protected from water when the cement is made into concrete as if it were sealed up in a bottle. In time, however, the hard protecting case of clinker is itself acted upon by the moisture of the atmosphere, etc., and becomes hydrated. The water then has a chance to get at the free or loosely combined lime and this in hydrating or combining with the water expands with great force and disintegrates the now fully hardened concrete, just as water freezing in an inclosed vessel will burst the container no matter what its strength may be. This is the most common explanation of the "blowing" or expanding of unsound cement, but be the reason what it may, it is a fact that such Portland cement sometimes expands to such an extent after hardening that the expansion may even be measured, and blocks of concrete made from such cement will sooner or later fall to pieces and disintegrate.

Certain brands are much more liable to this tendency than others. Some mills are provided with insufficient grinding machinery for the raw materials and hence can seldom make a cement which is sound when fresh. These depend on seasoning to make their product sound and hence, when pushed for orders, are very apt to ship fresh, and consequently, for them, unsound cement. Lack of knowledge or of skill in manufacture or of system in supervising the process often are the causes of unsound cement. It is probably easier to make a sound cement from cement rock alone than from any other material, and next to this comes the cement-rock-limestone mixture, the difficulty with this growing greater as the percentage of limestone in the mixture increases. It usually costs less to make an unsound cement than a sound one, because less care is needed in proportioning the raw materials, less grinding is necessary to prepare them for the kilns, and less coal may be employed in burning them. The block manufacturer should exercise care in purchasing cement to make sure he does not secure cheaply or carelessly made and often unsound cement. If he does secure such a cement, the result will be this: His blocks when freshly made and after "curing" will be sound and hard, and will present no sign of the dissolution, which may ultimately take place with

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	NOVEMBER				ELEVEN MONTHS ENDING NOVEMBER			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	6,000	$ 76	108,000	$ 299	6,411,230	$ 22,262	13,495,800	$ 42,523
Belgium...........	25,283,738	85,689	7,046,965	20,403	154,662,117	484,380	118,156,286	371,156
France............	811,900	3,147	944,360	4,107	12,119,592	41,516	6,775,760	25,037
Germany..........	15,147,696	41,328	36,110,629	108,880	183,977,376	613,535	167,461,532	555,920
All Other Europe.	....	....	....	....	3,010,635	10,265	240,659	609
British North Am.	25	1	....	....	226,475	1,180	165,110	1,591
Other Countries..	3,900	36	900	7	2,836,512	9,899	470,515	1,790
TOTAL...........	41,153,259	$130,277	44,210,854	$133,696	363,243,937	$1,183,037	306,745,662	$998,626
Domestic Exports of Cement, bbls.	139,013	$193,117	68,129	$96,920	670,774	$972,264	945,645	$1,299,961

There were 14,1·1,061 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Nov. 1904, valued at $43,887, against 5,777,730 lbs. in Nov. 1905, valued at $17,202.

For 11 months ending in Nov. 1904, there were 106,999 tons of asphalten imported in the United States, valued at $448,020, against 84,759 tons imported in 11 months ending Nov. 1905, valued at $364,015.

them. They will go out and be laid in the wall of the house. In time, possibly in a year, maybe more, the face of the blocks will begin to crumble and strip off the block; cracks will appear in it, and, if the cement was very much unsound, the block will eventually crumble away. This is no exaggeration. I have seen briquettes made of three parts sand and one of unsound Portland cement, the proportions often used in block manufacture, which when hardened for a week stood a tensile strength of over 350 pounds to the square inch, but which in less than a year had fallen to a powder in which almost every grain of sand was separate and distinct and the cementing agency which had at one time bound them together was merely a mass of light brown powder.

Unsound cement is by no means a rare occurrence either, and there are manufacturers who believe "no cement is bad" and ship fresh from their grinding mills any old thing they happen to be making, whether it passes the standard "soundness" test or not. The cement inspector of a large corporation recently told me that 90 per cent of the cement offered his concern by a certain manufacturer was rejected because of its failure to pass the soundness tests. Are *you* certain that you did not get any of this cement? I know that cement tests are expensive, yet I know of no better safeguard against unsound cement than the laboratory test. The next best thing is confidence in the knowledge, skill, care, and good faith of the manufacturer himself. The concrete block made of unsound cement differs in no way perceptible to the senses from those made of sound. It may not disintegrate for years, it may indeed for that matter never disintegrate, but the chances are that the blocks made of unsound cement will sooner or later crack and crumble, and the concrete block industry in the sections in which this does occur will very likely receive a serious setback thereby.

It is now generally recognized that seasoned cement is much better than fresh. My own experiments indicate that cement seasoned in bulk for about six months is at its best. Cement which has been kept in bags this length of time, unless stored in a dry place, may lump, and consequently the block manufacturer may have some trouble making a good sand mixture. There is much to be said in favor of the block manufacturer's buying his cement in large quantities and storing the same for some months. By doing this he will be much less likely to use unsound cement, since unsound cement is often cured or made sound by seasoning. The cement will also gain some in strength. Two objections to storage are the liability of the cement to lump or cake and possibly in some cases to its becoming quick setting. The latter tendency is usually met with in low limed and poorly manufactured cements, though under certain conditions all cements seem liable to become quicker setting with seasoning.

It is a well known fact to those versed in the technology of Portland cement manufacture that the addition of plaster of Paris to unsound cement often makes it pass the standard steam test, and that some manufacturers make a practice of so "doctoring" unsound cement. The addition, however, is harmful to cement as an excess of plaster not only causes the concrete to weaken in time, but also causes unsightly white streaks and efflorescence on concrete blocks. The unsoundness caused by plaster can only be detected by long time tests, so that the usual plan of guarding against it is by limiting the amount of sulphur trioxide found in the cement to 1.75 per cent. Since this is the active constituent in plaster of Paris, by determining the amount present (as can readily be done by a chemical analysis) we can calculate if a harmful percentage of plaster has been added to the cement.

While not strictly falling under the title of this paper, it may be well here to mention some causes of unsoundness in concrete blocks which are not due to the quality of the Portland cement itself, but to qualities which are developed in it by the use of certain chemicals, etc., added to facilitate manufacture or give color.

The demand for a quick setting cement has brought into use the carbonate and hydroxides of potash and soda. These chemicals are the base of nearly all the quick hardeners sold to the concrete block manufacturers. They cause unsoundness to a marked degree and should not be used except upon the advice of an expert cement chemist. They also cause efflorescence on the block. Some care should also be used to guard against coloring matters for the blocks which contain chemicals such as the sulphides or sulphates, chromates, acetates, etc., likely to react with the cement to the damage of the block. Most sulphides are readily oxidized to sulphates, which change is accompanied by expansion and consequently disintegration of the block. Pure oxide colors are the best and can be used with safety.

Sands with a large percentage of soda and potash minerals (such as mica) or containing pyrites (iron sulphide) are also objectionable for the reasons given above.

STRENGTH.

The strength which Portland cement may develop is due to various conditions of its manufacture, such as chemical composition, thoroughness of burning, and fineness to which it is ground. As cement is always used with sand, no attention need be paid to its neat strength, unless blocks are to be faced with very rich mixtures. Neat strength is very deceptive and is seldom a reliable indication of sand strength.

One of the most important qualities of Portland cement in determining the strength of the concrete made from it is the fineness to which it is ground. Other things being equal, the finer the cement the greater will be the strength of concrete. Thus a cement as ground by the manufacturer so that 96 per cent of it would pass a 100 mesh sieve gave a sand strength of 267 pounds in seven days, while the same cement ground to all pass a 200 mesh sieve gave 375 pounds for the same period, or an increase of 40 per cent in sand strength due to finer grinding.

In this connection it may be said that fine grinding seldom increased the neat test any, and indeed as a general thing lowers this, so that high neat tests when given without the sands tests may be regarded as meaningless.

The particles of cement retained on a 200 mesh sieve are entirely inert and may be looked upon as just so much aggregate. If these particles are sieved out and the attempt is made to make a block of them it will be found impossible to get the mass to cohere. Exactly how small the cement particles must be before they will be acted upon by water no one has yet determined, but it is known that of the material passing a 200 mesh sieve some of it at least is not fine enough. This has an important bearing on the value of the tests for fineness. For example, a cement all of which is ground just sufficiently fine to pass a No. 200 sieve is not in reality so fine as a cement ground in such a way that while some of it fails to pass a 200 mesh sieve, still the greater part of that which does is a more or less impalpable powder. Similarly cement ground 85 and 95 per cent through the 200 mesh sieve by rolls and other nonflouring methods of grinding is not really as fine as cement ground 75 per cent fine by other methods.

Since the particles of cement retained on a No. 200 sieve are inert, the purchaser may look upon all of such coarse material as so much waste matter whose place can be taken by sand without detriment to the resulting concrete.

Probably all concrete block manufacturers are striving for a waterproof block, one in which all the voids are filled. This latter may be achieved by the use of a richer mixture, by water proofing compounds, or preferably by the employment of a sand containing the proper proportion of fine particles. These fine particles help to fill the interstices between the coarse ones and to so keep out the water. One of the oldest principles of good concrete is "to coat the particles of sand with the cement paste" and that the strength of the concrete is proportionate to the thoroughness with which this has been done. Now the finer a body is pulverized the more surface it will present. Thus, if we divide a cube an inch square into halves, we will increase the surface area from six to eight square inches, and if we quarter it we will increase to ten square inches, etc. Consequently the finer the sand we use, the more surface there will be to coat and for exactly the same reason the finer must the cement be to coat this sand.

By using a sand containing fine particles and a finely ground cement in place of a richer mixture, fine cement is made directly more economical than the coarsely ground one. By "fine cement," however, is not meant a cement ground by rolls, etc., to show a good sieve test, but a cement which contains a large percentage of flour.

Since in such a dense concrete there are no voids, or practically none, there is no room left for the expansion of the cement during hardening, as is the case with ordinary porous concrete where the cement can usually expand a little into the spaces between the sand grains, it is doubly important to use a sound, or, in other words, a non-expanding, Portland cement.

The setting time of Portland cement also has an important influence on the strength. Slow setting cements—that is, cements which get their final set in from four to nine hours—are much stronger than those which set more quickly. Quick setting cements are nearly always overclayed and contain less of the active silicate and aluminate of lime, to which cement owes its strength, than the slower setting ones. This may seem paradoxical but it is nevertheless true. The compounds in cement which set quickly are not those which give it great strength, consequently cements giving an initial set of less than thirty minutes are hardly ever as strong as those which require two or three hours. For example, a cement which sets in thirty minutes rarely ever, unless very finely ground, gives a seven day sand test of over 250 pounds, while one with a set of two or three hours may easily give 300 to 350 pounds, or even more. Cements with a "flash" set — that is, which set up under the trowel—should not be used in making blocks, as these latter are apt to be weak. With such cements the set is broken by working, the processes of solution and crystallization are interfered with, and consequently the cement has only half a chance to do its work. The set of the cement should always be sufficient to give ample time to mix the mortar and fill the machine or molds.

One of the greatest requisites of Portland cement to be used for concrete blocks is that it should be a quick hardener. It must get its strength promptly. By prompt hardening is not meant quick setting cement. The term set is merely used to define the change undergone by the mortar in passing from the plastic to the solid state. The hardening only begins after the setting process is completed and quick setting cements are not necessarily prompt hardeners.

The best test for prompt hardening is the seven day sand strength. Cements which get a tensile strength of 300 to 350 pounds per square inch in seven days are now on the market and these are best suited to concrete block manufacture. No attention need be paid to increase in strength. If the blocks do not lose strength the sooner they get their full strength the better, because the sooner they can be used and the less time is needed to cure them. A cement which has a sand strength of 350 pounds after seven days and which has only increased fifty pounds in a year is to my mind much better than one which has a strength of 200 pounds at seven days and increases 150 pounds in the same length of time, because it will stand the same stress seven days after making that the other one will after it is a year old. A building may have to stand its full load three months after the blocks are made and hence the prompter hardening cements are needed for block manufacturing.

Below is an example of the two classes of cements, prompt hardeners, and those with what their manufacturers point to as a progressive increase:

	7 dys.	28 dys.	3 mos.	6 mos.	1 yr.	2 yrs.
Prompt hardener..	375	382	380	395	415	415
Progressive hardener..	212	275	282	312	350	366

Cements made in the old fashioned upright kilns are all slow hardeners, while the higher limed rotary kiln cements are usually prompt hardeners. Upon the introduction of the rotary kiln in this country, about 1890, those who still used the upright kilns in America and the German manufacturer who used them exclusively and who also, at the same time, imported largely into this country, used this argument continually to keep the rotary cements out of the market, that Portland cement should show a slow progression gain for a period of ten years or more. It is interesting in this connection to remark that the German scientists must now be satisfied that prompt hardening cements are all right, since they are rapidly replacing their upright kilns by rotary kilns, and some of their leading scientists have become the champions of high lime, prompt hardening cements.

A prompt hardening cement and a slow hardening cement can be made from the same batch of clinker, as the burned unground cement is called, by grinding one lot coarse and the other fine. If the coarsely ground is "volume constant" or "sound" it will usually give a cement which gives low tests at first and finally fairly high ones. The finely ground cement, on the other hand, will give tests which are usually high at first and increase very little comparatively with time. This shows that slow hardeners are merely Portland cements with more or less slowly acted upon material in their make up. This material may be coarse particles of cement or material of feeble hydraulic properties, which only begins to hydrate after a long period in water. Portland cement can also be made slow hardening by additions to it of such substances as ground slag, limestone, cement rock, rosendale or natural cement, etc.

All rotary cements are not prompt hardeners, as chemical composition, as well as methods of burning, influence this. Prompt hardening cements usually cost slightly more to make than slow hardeners, as they usually contain a higher percentage of lime. This necessitates finer grinding of the raw materials and harder burning to make a sound cement.

Unsound cements give high short time tests, which fall off remarkably with time, until ultimately the briquettes may fall to pieces of their own accord. Prompt hardening cements often give neat tests which are high at seven days and fall off somewhat after that period. The old theory was that this showed interval agencies at work disrupting the briquettes, but it is now generally accepted that if the cement is sound, falling off in strength of neat briquettes is due almost entirely to the fact that as the cement hardens it becomes brittle and more easily broken by the sudden torsional strains, etc., to which the briquettes are subjected in testing. Sand tests, both tensile and compressive, made of the same cement seldom show any marked falling off and hence, since cement is always used with sand and in compression or abrasion, no attention need be paid to the brittleness of the neat briquettes. Where, however, blocks are to be faced with rich mixtures such as one of cement to one and two of sand, some attention may be given to neat tests also, or better still special briquettes may be made using the proportions to be employed in facing the block. If the latter cannot be done, cements giving good, neat test should be employed, and since unsound cements are more apt to give trouble in rich mortars than in lean, for the reason explained before, only well seasoned cement should be used.

Concrete blocks are now sometimes waterproofed by coating their exposed surface with a thin layer of paraffine. This thin layer effectually protects the interior of the block from the moisture of the air, and as cement can only harden by hydration (absorption of water) the block can not gain in strength after it is so coated. Consequently where waterproof blocks are made, prompt hardening cements should always be used and the block should be allowed to gain good strength before applying the coating. For a similar reason these blocks should not be made too dry.

In connection with the use of waxes, etc., for waterproofing it may be well to state that certain waxes and fats are very likely to decompose in time with the formation of "fatty acids." These acids attack the concrete by dissolving out the binding agent, hydrate of lime, from between the sand grains. Pure paraffine, however, does not decompose into fatty acids, but some animal fats and vegetable waxes are very likely to do so.

COLOR.

The concrete block manufacturer will probably be more interested in the color of his blocks than in any other one of their properties, since upon this will depend the immediate marketing of his product. Uniformity of color is therefore very important to him, since the color of a building, in order to be pleasing, should present a uniform appearance to the eye. Uniformity can only be secured by making the block of uniform cement and sand, mixed in definite proportions and manufactured into blocks under as nearly the same conditions as it is possible to obtain. For colored blocks dark colored cements may be used, but their color should be uniform. For lighter blocks light colored cements must be used. As the color of cement gets lighter as it is ground finer, only finely ground cements should be used for this work. The percentage of iron and manganese in the cement also influences the color. Cements free from iron and manganese would be white, and the color darkens as the percentage of iron or manganese increases. Most cements are practically free from manganese, and hence the color is usually due to iron.

Sulphate of lime, which is always added to cement to regulate the set, is one of the causes of the white efflorescence seen on concrete blocks. This salt is soluble and is carried to the surface of the block by the water which sweats out during curing. The less sulphate of lime present in cement intended for concrete block manufacture, the better. As Portland cement can be obtained which contains less than 1.5 per cent sulphuric anhydride (the chief constituent of the sulphates and the way they are usually reported in a chemical analysis), it is hard to see why cement containing more than this amount should be used.

The alkalies are also soluble salts and are to some extent responsible for the saline efflorescence on concrete. Cements low in these should therefore be used. Most American Portland cements, however, contain less than 1 per cent alkalies.

Sulphides of iron are sometimes met with in cements burned in upright kilns. This causes dirty brown splotches to appear in the work from the oxidation of the iron to brown oxide of iron or "rust." Overclayed cements also show the same dirty brown color throughout the mass, as in such cements the iron seems to be present as the red brown "sesquioxide" instead of the black "magnetic" oxide of well made cements.

PORTLAND CEMENT.

Production in 1904.

Following is a table showing the quantity and value of the production of Portland cement in the states manufacturing this product in 1902, 1903 and 1904:

Production of Portland cement in the United States in 1902, 1903, and 1904, by States.

State.	1902.[a]			1903.[a]			1904.[b]		
	Number of works.	Quantity.	Value.	Number of works.	Quantity.	Value.	Number of works.	Quantity.	Value.
		Barrels.			Barrels.			Barrels.	
Alabama	1	....	....	1	....	....	1	....	....
Arkansas	1	....	....	1	....	....	1	....	....
California	2	294,156	$431,910	3	631,151	$1,019,352	3	1,014,558	$1,446,909
Colorado	2	82,044	105,016	1	258,773	436,535	1	490,294	638,167
Georgia	1	....	....	2	....	....	2	....	....
Illinois	4	767,781	977,541	5	1,257,500	1,914,500	5	1,326,794	1,449,114
Indiana	3	536,706	628,244	3	1,077,137	1,347,797	4	1,350,714	1,232,071
Kansas	1	830,050	1,017,824	1	1,019,682	1,285,310	2	2,643,939	2,134,612
Kentucky	......	....	....	......	....	....	1	....	....
Michigan	10	1,577,006	2,134,396	13	1,955,183	2,674,780	16	2,247,160	2,365,656
Missouri	1	....	....	2	825,257	1,164,834	2	....	....
New Jersey	2	2,152,158	2,563,355	3	2,693,381	2,944,604	3	2,799,419	2,099,564
New York	10	1,156,807	1,521,553	12	1,602,946	2,031,310	12	1,362,514	1,257,561
Ohio	7	563,113	685,571	8	729,519	998,300	7	910,297	987,899
Pennsylvania	15	8,770,454	10,130,432	17	9,754,313	11,205,892	17	11,496,099	8,969,206
South Dakota	1	....	....	1	....	....	1	....	....
Texas	2	165,500	234,950	2	....	....	2	....	....
Utah	1	....	....	1	....	....	1	....	....
Virginia	1	[a]334,869	433,286	1	538,131	690,105	1	864,093	774,360
West Virginia	......	....	....	1	....	....	1	....	....
Total	65	17,230,644	20,864,078	78	22,342,973	27,713,319	83	26,505,881	23,355,119

[a] The States combined for 1902 and 1903 are mentioned in the text of the reports for those years.
[b] The States combined for 1904 are given in the text below.

As heretofore, states having but one producing cement plant have the figures showing their output combined with the figures for some other states to avoid exposing individual productions, which are not published except in combinations to make state totals, unless for some especial reason and with the full permission of the persons concerned.

In the table above the state combinations are as follows: Alabama, Georgia, West Virginia and Virginia are reported together; the products of Kansas and Missouri are given in combination; and Colorado, Utah and Texas have their products combined. In each case the combined product is given in connection with the state which was the largest producer.

For the year 1904, one new state is added in the table showing where the Portland cement plants of the United States are located, for the reason that although Kentucky did not produce Portland cement in 1904, the plant for that purpose was practically completed in that year. No new plants were started up in states not already recorded as producers of Portland cement.

The states stand in the same order of rank for 1904 that they held in 1903, so far as the leading producers of Portland cement are concerned. Pennsylvania, the heart of this branch of the cement industry, still holds first place, with a product which is more than 40 per cent of the total quantity of cement manufactured in 1904. She increased her lead over that of the pervious year by 1,741,786 barrels, and stands 8,696,680 barrels ahead of New Jersey, which ranks second, with a production amounting to 10.56 per cent of the whole. Michigan is still in the third place, her production being a trifle less than 8½ per cent of the total quantity of cement manufactured. New York was the fourth producer of Portland cement in 1904, having made about 5 per cent of the entire production.

When the pioneer cement plants turned out a few thousand barrels as a good year's work, the lead of a million or two barrels in a state would have meant much more than it did in

1904, when a number of plants—notwithstanding 1904 was a bad year—ran up into the millions of barrels for their individual production.

The states included in all other sections in the following table are Alabama, California, Colorado, Georgia, Illinois, Indiana, Kansas, Missouri, Texas, Utah, Virginia and West Virginia, together with such counties in Pennsylvania as are not included with Lehigh and Northampton counties.

As in the similar table for 1903, Warren county, N. J., is not included with the Pennsylvania counties, but is included in the separate statement of the output of New Jersey.

Following is a table showing the growth of the Portland cement industry in the United States since 1890:

Development of the Portland-cement industry in the United States since 1890.

Section.	1890.			1900.			1902.		
	Number of works.	Quantity.	Per cent.	Number of works.	Quantity.	Per cent.	Number of works.	Quantity.	Per cent.
		Barrels.			*Barrels.*			*Barrels.*	
New York	4	65,000	19.4	8	465,832	5.5	10	1,156,807	6.7
Lehigh and Northampton counties, Pa., and Warren County, N.J.	5	201,000	59.9	15	6,153,629	72.6	17	10,829,922	62.9
Ohio	2	22,000	6.5	6	534,215	6.3	7	563,113	3.3
Michigan	....	....	....	6	664,750	7.8	10	1,577,006	9.1
All other sections	5	47,500	14.2	15	663,594	7.8	21	3,103,796	18.0
Total	16	335,500	100.0	50	8,482,020	100.0	65	17,230,644	100.0

Section.	1903.			1904.		
	Number of works.	Quantity.	Per cent.	Number of works.	Quantity.	Per cent.
		Barrels.			*Barrels.*	
New York	12	1,602,946	7.2	12	1,362,514	5.1
Lehigh and Northampton counties, Pa	13	9,631,541	43.1	15	11,411,620	43.1
New Jersey	3	2,693,381	12.1	3	2,799,419	10.6
Ohio	8	729,519	3.3	7	910,297	3.4
Michigan	13	1,955,183	8.7	16	2,247,160	8.5
All other sections	29	5,730,403	25.6	30	7,774,871	29.3
Total	78	22,342,973	100.0	83	26,505,881	100

The production of Portland cement in the United States in 1904 was confined to 17 states, two other states, with but a single plant each, being nonproductive. In detail, the state production was as follows:

Alabama.—This state has but one plant manufacturing Portland cement, and that plant ran slightly behind its production for the previous year. The mills were closed down for several months, during which time alterations and improvements were completed. The only other plants in the state are manufacturers of slag cement, though there is a project for another Portland cement plant which will be located at Selma, where well-known deposits of limestone suitable for use in the production of Portland cement occur abundantly. As yet, however, the mill has not been built. The other cement factories in Alabama were both active in 1904.

Arkansas.—The only plant in the state of Arkansas which has ever produced cement was idle throughout the year 1904. This mill has abundant material for the economical production of cement, and is built in a locality where no immediate neighbors exist to create competition. The low price of cement during the year and lack of funds with which to operate were the causes responsible for the idleness of the mill.

California.—There has been a steady and very marked increase in the output of cement from California within the last few years. In 1902 the returns showed but little more than a quarter of a million barrels of Portland cement produced in the state. In 1903 this amount was increased to more than a half million barrels, and in 1904 the total production for the state ran up to more than a million barrels. This quantity of Portland cement is the output of the three plants located in California. Of these three mills, one was idle nearly six months undergoing repairs and remodeling, one was closed for a short time that it might be overhauled, and the other ran practically on full time for the year. The increasing market for American cements in the Pacific States has had a marked effect on the imports of cement on that coast, and the entire success of the home product is each year more fully assured.

Colorado.—There was only one plant producing Portland cement in Colorado in 1904, and this plant had a much larger output than that recorded for the preceding year. This company, it will be remembered, absorbed its only competitor in the state in 1902, and increased its own capacity greatly thereafter. There is now another company in Colorado that has at present some facilities for burning cement, and the writer is informed by them that the erection of a large, modern Portland cement plant is contemplated in the near future. As about 85 per cent of the cement made in the United States is manufactured east of the Mississippi river, and as the freight rates on cement shipped to the west from eastern factories are heavy, there should be sufficient room for a number of new cement mills in Colorado, where raw materials for the industry are abundant.

Illinois.—There were four active Portland cement factories in Illinois during 1904, and one factory which remained idle on account of the condition of the cement market. Of the four active plants, two were closed down three months for repairs, and the other two ran on full time throughout the year. The Illinois Steel Company did not complete its new plant at Buffington, Ind., in time to manufacture cement, until January, 1905. This plant is more fully described as to its location in the detailed account of the state of Indiana; though that it is built just across the state line dividing Illinois from Indiana, instead of just within it, is a mere chance and due to the fact that at the time when the building of an additional plant was desirable, there was no other land available for purchase by the Illinois Steel Company which was as near to its mill at South Chicago as the site at Buffington. The enterprise and the capital invested in the Indiana factory belong entirely to Illinois. The three other cement plants in this state produce only natural-rock cement.

Indiana.—The Portland cement industry was fairly prosperous in this state in 1904, notwithstanding the uncertain market, and the three plants which contributed to the total production had a larger output than they had in 1903. All three of the mills ran practically without interruption through the entire year. The plant at Mitchell was not closed down at all, and the company owning it expects to build a second factory there in 1905, still further to increase its Indiana production of cement. The plant at Bedford is now in operation and is to be active through the current year. It was not started up until just after the close of 1904. It has a capacity of 2,000 barrels of Portland cement per day, and the limestone and shale used for manufacturing are both to be had on the grounds where the mill stands. The new plant erected at Buffington by the Illinois Steel Company is located just without the Illinois state line, instead of just within it, as are the two other plants owned by the company. The factory is completed, and was started up in January, 1905.

It has sixteen rotary kilns, each 80 feet long by 7 feet high at the fire end and 5 feet 6 inches at the stack end, capable of turning out sufficient clinker to make 4,500 barrels of Portland cement per day. Power for the electric motors is supplied from the South Chicago works, 10 miles distant, at less than a 4 per cent loss. The current is supplied by two 2,000-kilowatt generators, and steam is furnished by boilers fired with waste gases from the blast furnace in South Chicago. As in the company's slag-cement factory at North Chicago, Ill., and its Portland cement plant at South Chicago, Ill., the raw materials used are obtained in the state of Illinois, the same quarry furnishing limestone for all three of the plants. The railroad used in shipping material from Chicago to Buffington also belongs to the company owning the cement plants. Therefore, although it is necessary, in order to preserve the integrity of this report as to totals of state production, to credit the cement manufactured at Buffington to Indiana, yet the fact that this new plant is but the third branch of a large Illinois company and that all the raw materials used, as well as the money invested, come from that state, should not be overlooked.

There are four other Portland cement companies reporting from Indiana besides the natural-rock cement producers. Of these four, one has dissolved, one has gone into the hands of a receiver, and one has not yet been satisfactorily capitalized, though there is a good prospect it will be in the coming year. The fourth company is one which will build a Portland cement plant at Speeds. As yet only the preliminary work has been done, but the factory will probably be finished in 1905. It will have two rotary kilns, which will give a capacity of from 500 to 600 barrels of cement per day. Ball and pebble mills for both raw materials and clinker will be installed. Cement will be produced from the limestone underlying the natural cement rock in a quarry owned by this company, and from a shale which lies about three miles west of the quarry. The shale is to be brought to the plant by means of a narrow gauge railroad built for that purpose.

Kansas.—For the first time Kansas has more than one cement plant devoted exclusively to the manufacture of Portland cement. The first plant to produce that article in the state was that of the Iola Portland Cement Company, whose first output was made in 1900. The second plant, that of the Kansas Portland Cement Company, has its first record for producing Portland cement in 1904. Its mills, which have a capacity of about 1,200 barrels per day, were started in February, and the plant continued to operate during the rest of the year. It is well located from an economic standpoint. The raw materials used in producing cement are obtained near the mill, and natural gas is the fuel used. The result of the first year was unusually good. There are two Portland cement plants now under construction in this state, and if the conditions in the cement world justify such a step they will both be completed and in active operation before the close of 1905. The other and older plants in Kansas produce only natural rock cement.

Kentucky.—This state, for so many years associated with cement only as a producer of and selling center for the famous natural rock product known as Louisville cement, has now a completed plant for the production of a first class Portland cement. The factory is located at Kosmosdale, which was formerly known as Riverside, and is only a few miles from Louisville, in which city are the company's offices. The raw materials used are limestone and clay; the quarry whence the limestone is obtained lies near the Ohio river, about thirty miles above the plant, and the limestone is brought to the mills by means of river transportation, and the clay beds, which show clay of unusual excellence, underlie the plant itself and extend over more than 800 acres of adjacent land, all of which is owned by the company operating the cement plant. Pulverized coal is the fuel used, and it also is brought to the mills by river transportation. The buildings of the entire plant are substantial, being of structural steel walled in with cement mortar on expanded metal, and making a construction which is practically fireproof. There is also an especial provision for clinker storage, which is regarded as valuable, since the ripening of clinker is known to play an important part in the constancy of composition in Portland cement. Electric power is used for driving the machinery and for lighting many of the houses built by the company for its employes. These houses are of concrete construction. As at present completed, the plant has a producing capacity of 2,500 barrels of cement per day, but it is the intention of the owners to increase this capacity to 5,000 barrels per day in the near future, and the buildings have been constructed with a view to such an extension. Philadelphia capital is back of this enterprise, and the plant is said to have cost nearly a million dollars. At the time of the writer's visit to Kosmosdale the buildings and factory were incomplete, but at the present time [May, 1905] they are finished and the mills are in operation.

Michigan.—Of the sixteen Portland cement plants in this state in 1904, thirteen produced the output of cement for the year. One of the plants was not completed until June, and several of the older plants were shut down for a much longer period than is usual during the winter. One plant had a disastrous fire and was closed more than half the year, in order to rebuild, and another was compelled to close down while the machinery was undergoing necessary repairs. Another company closed its mills for several months, in order to make extensive improvements, and several factories were closed because of low prices, lack of orders, and overproduction. Notwithstanding these facts Michigan holds her place as the third largest producer of Portland cement in the United States, and her production for the year is in excess of that for the preceding year. There are several companies in this state that report that they are about to build cement plants, and there are a number of new plants, now practically complete, which have not been started up. One factory is in the hands of a receiver; and one company reports that its project is abandoned, and that the money subscribed has been paid back. The writer desires to call attention to the fact that on page 32 of the pamphlet upon the production of cement in 1903, issued by this bureau in 1904, there is a line mentioning the name of the White Star Portland Cement Company as being among those companies which had abandoned the intention of building cement plants. Later information received from this company states that such is not the case; that the intention to construct a factory still exists, and that the company is still pursuing its enterprise. This company should properly come under the head of those whose projects have not yet taken the material shape of a cement factory.

A plant reported as one which will be completed late in 1905 or early in 1906 is that of the Standard Portland Cement Company. This organization owns 3,000 acres of marl lands in Benzie county, besides owning about 1,000 acres of limestone and cement rock property in Charlevoix county. The first project was to utilize the marl in producing Portland cement, but having become convinced that the rock process of manufacture would be a less expensive one the company decided to build a cement plant on the lands near Charlevoix and to make cement from limestone and shale. The holdings of the company include shale lands in Charlevoix county. Several large limekilns are also being built, as it is the present intention of the company to produce lime as well as Portland cement.

Missouri.—The two factories which made Portland cement in this state in 1904 were both active throughout the year, save for some trifling interruptions for necessary repairs. The output was in advance of that for the previous year. The plant at Louisiana is still in process of construction, and its completion will hardly be accomplished before the close of 1905. It is now expected by the owners that the mill will be started in January, 1906. There is no production of natural rock cement in this state, and it is only within the last three years that any kind of hydraulic cement was produced here.

New Jersey.—The record for New Jersey in 1904 does not vary greatly from that for 1903. There were seven companies reporting, but of them only three were cement producers. Of these three, two ran ahead of their production for the previous year and one fell behind. Of the others, two had not yet completed their plants, one was idle, and one had given up its organization and abandoned its intention of building a factory, at least for a time. The plant at Stewartsville again suffered from fire in its coal building, caused presumably by a bit of oily waste which took fire while going through the drier with the coal. It then dropped into the bottom of an inclosed elevator and set fire to the coal, which generated gas until the casing was filled, when it exploded. This is a much more unusual cause for fire or explosion than the cause which led to the same results in 1903. To avoid a recurrence of either accident, the coal at the plant is not now dried with direct heat, but by means of steam instead. It is the present intention of the company owning this plant to increase its capacity to 5,000 barrels of cement per day during the latter part of 1905. The state production of New Jersey again shows an increase over that for the preceding year.

New York.—Three of the twelve companies that produced Portland cement in New York state in 1904 also produced natural rock cement, and nine companies were idle the greater part of the year, and a number of them closed down their plants for shorter periods of time. Among the many causes that entered into the shutting down of plants in this state during the year were bad market conditions, lack of orders, some installations of new machinery, low prices of cement, legal complications, low water, labor troubles, coal shortage, full storage bins, and fire. One plant which has reported a production of cement for many years was idle throughout the year, overhauling the mills and preparing to install rotary kilns instead of the upright kilns, in which heretofore the Portland cement has been burned, and one plant was sold outright. The factory at Wayland was burned down on Christmas day, the plant being totally destroyed. The origin of the fire is unknown, and the loss is about $140,000, only a part of which is covered by insurance. It is not yet decided whether the plant will be rebuilt or not. The number of factories engaged in the manufacture of Portland cement in New York was the same in 1903 and 1904, but the quantity of cement produced was less in 1904 than it was during the preceding year. A large iron company in the state now contemplates the erection of a mill for the production of slag cement, in order to make use of the slag from the foundry. This plan has not yet been definitely decided on, however.

Ohio.—The decline in the cement market throughout the year 1904 affected the production of cement in Ohio, although the Portland cement manufactured for that year was more than that produced in 1903. The plants which were closed down for repairs and new machinery were not opened again as speedily as possible, and one plant remained idle during the entire year because of low prices. There were seven factories in operation, all of which produced Portland cement exclusively. The two plants producing slag cement were active, as was the only factory in the state which produced natural rock cement. The new plant of the Wellston Company, which took the place of that destroyed by fire, was started up in July, and in November it was found necessary to close it down in order to install additional machinery and engine power. The quarry belonging to this company is at Oreton, about sixteen miles from Wellston, and here limestone and coal are mined from the same hill. The shale, too, is immediately adjacent. The company owns a very large and valuable tract of land containing almost unlimited deposits of materials well adapted to the production of an excellent Portland cement, and the erection of another large plant, to be located at Oreton, is being considered.

Pennsylvania.—The number of mills operated for the production of Portland cement in this state in 1904 was seventeen, and the quantity of cement produced was an increase of nearly 2,000,000 barrels over the quantity manufactured in 1903. Five of the seventeen active factories produced both natural rock and Portland cement. Two companies that had reported themselves in 1903 as about to build cement factories abandoned their plans entirely in 1904. Three plants were idle during the year, and five are reported as being under construction and likely to become active producers in the near future. The National Portland Cement Company's plant at Martins Creek, which was not completed in 1904, will probably be active in 1905. It is a large plant, extending over more than five acres of ground. There are already installed sixteen rotary kilns, each having a capacity of 200 barrels per day. The factory is well equipped for transportation, being located near the Pennsylvania, the Delaware, Lackawanna and Western, and the Lehigh and New England railroads. Electric power is used throughout the plant. The new mill at Penn-Allen was started up about the middle of the year, and made a very saitsfactory production during the remaining six months. Several of the active plants ran all the year, but the majority of those reporting a production of cement for 1904 also report idleness for some part of that year, ranging from periods of one to ten months in length. A comparison of the values of the total state productions for 1903 with 1904 will show that the falling off in prices of Portland cement struck most heavily upon the eastern market. The 9,754,313 barrels of cement produced in Pennsylvania in 1903 had a value of more than $11,000,000, while the more than 11,000,000 barrels of cement made in 1904 sold for less than $9,000,000.

South Dakota.—There is but one cement plant in South Dakota, and it is devoted exclusively to the production of Portland cement, using as materials for manufacture chalk and clay. In 1904 this factory did not have a production, owing to an entire remodeling of the plant and the installation of more modern machinery than that heretofore used. The five vertical kilns heretofore used in this mill are now replaced by four rotary burners, each 100 feet in length and seven feet in diameter, and in place of millstones in the grinding department six Kent grinding mills have been set up. Coal drying and grinding machinery has been put in and the boiler capacity doubled. Under the present process of manufacture coal will entirely replace the coke formerly used, and an increase of about four times the former average output is confidently anticipated by the company in 1905. There was in 1903 a project to erect a second cement plant in another part of South Dakota, but the organizers of the plan report postponement of their enterprise until such time as better prices are established in the cement market.

Texas.—In 1904 one of the three cement plants in this state was idle, one was closed nearly half the year, but produced a large quantity of Portland cement during the remaining months, and the third manufactured both natural rock and Portland cement. This plant was closed down during a part of the year. The activity of the factory purchased by a Kansas company and remodeled during the previous year materially increased the total state production.

Utah.—The output of Portland cement made by the single cement plant in Utah was more than twice as large in 1904 as it was in 1903, notwithstanding the fact that it was shut down for several months during 1904. In 1903 the plant was rebuilt and its capacity increased, so that the mills now have four rotary kilns, two of which are sixty feet and the other two fifty feet in length.

Virginia.—The report of this state in 1904 is practically a repetition of its report for 1903 except for the increase in production. The only plant producing Portland cement had a very successful run and was active all the year, with the result that its production showed a marked increase over that for 1903. This company uses limestone and shale as its raw materials, and has now ten active rotary kilns, sixty feet long by six feet in diameter. There are no new plants reported, and the only other factories in the state manufacture only natural rock cement.

Washington.—The plant for producing Portland cement in the state of Washington is still a probability, though a large tract of land has been purchased near Seattle for this purpose. If in 1905 the increased demand for and higher prices of cement materialize, it is not unlikely that the cement plant which has been promised in this state for some time past will be built, and that Washington will enter the field as a competitor in the great northwestern section of the United States where the demand for cement so far surpasses the local supply.

West Virginia.—All of the Portland cement made in this state in 1904 was the product of one factory. Unfortunately this plant had a disastrous fire during the year and was closed down for a little more than six months in order to rebuild and put in some improvements. Even taking this into consideration, however, the factory made a very satisfactory production. The other Portland cement plant in the state was not started up at any time during the year.

Materials Used for Portland Cement.

Portland cement in the United States is manufactured from a variety of materials, all of which, in proper chemical combinations, give practically the same resulting product.

These materials are limestone, marl, chalk, argillaceous limestone or cement rock, slag, shale, and clay, which should be so proportioned as to produce a mixture that will come within the prescribed bounds from which a good Portland cement may not depart. Following is a table showing the quantity and value of cement made from the use of these materials and the number of companies using the various kinds in 1904:

Table showing materials us d in making Portland cement in the United States in 1904.

Materials used.	No. of Companies.	Quantity	Value.
		Barrels.	
Limestone and cement rock...........	21	13.902.939	$10.733.588
Limestone and shale.	18	5.631.686	4,937,740
Marl and clay.........	17	3,332 873	3.585,113
Limestone and clay..	17	3.141.010	3,546.532
Limestone and slag..	3	497,373	552,146
Chalk and clay........	2	Idle.	
Total..............	*78	26.505,881	$23.355,119

*The five mills not included in this number were either new or inoperative in 1904.

The two plants using chalk as the calcareous material for their cement were both idle in 1904. One of them was remodeled and improved. It is probable that both will be active in 1905.

The figures showing total production of Portland cement in the United States have steadily grown larger during the last decade. The amount of increase shown each year as compared with the previous year is not so large in 1904 as it has been at any time within the three preceding years, as illustrated by the following table:

Production of Portland cement in the United States, with yearly increase, 1895-1904.

Year.	Quantity	Increase.	Percentage of increase.
	Barrels.	Barrels.	
1895....................	990,324	191,567	24.0
1896....................	1,543,023	552,699	55.8
1897....................	2,677,775	1.134.752	73.5
1898....................	3,692,284	1,014.509	37.9
1899....................	5,652.266	1,959.982	53.1
1900....................	8,482,020	2,829,754	50.1
1901....................	12,711,225	4,229.205	49.9
1902....................	17,230,644	4,519,419	35.6
1903....................	22.342.973	5,112,329	29.7
1904....................	26.505,881	4,162.908	18.6

AN EXPLANATION.

The Cement Machinery Co. of Jackson Mich., had no exhibit at the National Cement Users' Convention at Milwaukee. This fact was noticed by many members of the association who wanted to know the reason. While arrangements were fully perfected to have a $10,000 exhibit covering the Normandin, Cemoco, Peninsular and Champion block machines, The Favorite sand, cement, brick machines, Universal post machines, and the Popular Systematic mixer were all held at Jackson awaiting definite information from officials of the National Cement Users' Association as to the exact place of holding the convention. Several technical journals published notices stating the convention would meet at Columbus, Ohio, instead of Milwaukee. A report on July 6 followed that Milwaukee would be the place of meeting. This left only two full days for shipping exhibits from Jackson to Milwaukee by freight and placing the same on the exhibition floor. Mr. Sid. L. Wiltse represented the company at the convention and succeeded in taking care of the company's numerous customers, receiving many orders without having an exhibit. The company is overrun with orders, working their factory night and day to keep up with orders booked. The trade outlook for 1906 is extremely flattering for their entire line of high-grade machinery.

Trusting that the above explanation for the failure to exhibit at Milwaukee has been made clear to the company's many friends and that it will bring them many new friends who are interested in concrete machinery,

CEMENT MACHINERY CO.

THE IOWA CEMENT USERS' CONVENTION.

The second annual convention of the Iowa cement users will be held at Ames, Iowa, February 8 and 9. There should be a large attendance, as many interesting papers will be read on the subject of cement and its application to building constructions.

Art Portland Cement Company of Kimmell, Ind., has plans under way for its plant. Architect Edward Hoykendorf of Syracuse, Ind., being employed for this purpose.

There is some talk of removing the Hecla Portland Cement plant from Bay City to Alpena by the new owners.

BOOK NOTICES.

PROVISIONS AGAINST ACCIDENTS

The Monarch system of automatic devices for preventing accidents in mills and factories is described in severla pamphlets issued by the Consolidated Engine Stop Company of 100 Broadway, N. Y., which can be had on application. The Monarch system installed in a factory permits the stopping of machinery from any part of a building by pressing a push button. This insures greater safety and freedom from accidents, thereby limiting the extent of accidents to employes; in other words, it reduces the hazard to a minimum; and courts in accident cases look with favor on the latest modern devices installed in works to secure the greatest possible safety to employes, as doing away with willful negligence on the part of the employer.

NEW YORK LETTER.

While trade conditions in cement and concrete circles are at the point described as "seasonable," the outlook for early spring business is favorable. Labor troubles just now indicate a holding back of building operations, but may later be satisfactorily adjusted. Cement manufacturers seem fairly well satisfied with 1905 business and predict better sales for the current year. Just now the demand for Portland cement is quiet. Local quotations are: Rosendale, in wood, per bbl., 85@95c; American Portland, at dock, in wood, per bbl., $1.55@1.60; German Portland, per bbl., $1.90@2.10.

The executive committee of the National Association of Cement Users held a meeting here December 28, presided over by Merrill Watson. At the annual convention at Milwaukee this month a number of local constructors, etc., have arranged to be present.

T. Edwin Tomlinson, 49 East Fifty-eighth street, is interested in the recently organized Concrete Steel Company of New York, capitalized at $150,000.

A visit to Secretary H. W. Remington of the Hayden Automatic and Equipment Company, 26 Cortlandt street, found him very busy, but he took time to say: "We are busy and sales of the Hayden block machine are increasing most satisfactorily. The Brazilian government has adopted the Hayden concrete block machine to use in reproducing the Louisiana building at the St. Louis exposition, which the government will build on the Boulevard at Rio Janiero. The structure will be of reinforced concrete and the steel alone will cost $29,000." Mr. Remington referred to several recent exhibits of concrete blocks made on Hayden machines and said the exhibits had aided in sales. Among recent building operations the Hayden made blocks have gone into are the Panama-American Corporation's ice making and electric plant at Panama City, Panama. The building is 123 by 90 feet, 32.8 feet high, with two story portico. W. M. Scott, general manager of the Hayden Company, Columbus, Ohio, has built a two story concrete residence there, with dormer roof. It is said the new Fidelity Warehouse building at Baltimore is the largest structure of concrete ever built. The international system of wire reinforcement was used in the roof, on top of which plastic slate was put. Concrete blocks used were made on Hayden machines. Among those who have recently put in Hayden block machines are: The Haworth Stone and Building Company, Haworth, N. Y. (they have in two machines and anticipate installing ten more); the J. J. Bliss Construction Company, Jamaica, L. I., three machines; F. W. Tyler, Vandeveer Park, Brooklyn; H. Schmand, Richmond, L. I.; Far Rockaway Concrete and Lumber Company (George Keiser president), Far Rockaway, L. I.; Plainfield (N. J.) Cement and Stone Company, two machines (this company among other products will manufacture fence posts); McGann & Calleny, Hoboken, N. J.; New York Realty Company, Tuckahoe, N. Y.; Frank Dromgoolde, Mt. Kisco, N. Y.; New York Concrete Stone Company, Stamford, Conn. (this company has a Flood concrete mixer); H. F. Becker, Garwood, N. Y.; the Standard Concrete Stone Company, Roselle, N. J.; F. W. Tyler and F. E. Maine of Flatbush, L. I., intend forming a copartnership to manufacture concrete blocks; Schroett & Hanson, Corono, L. I.; and W. E. Wagg, Lambertville, N. J. In the basement of the office building, 26 Cortlandt street, the Hayden Company has a block machine in practical running order, and frequent "demonstrations" are given to prove its merits to prospective publishers.

R. F. Tucker, recently elected president of the Concrete Association of New York, is a member of the firm of Tucker & Vinton, reinforced concrete construction, room 618, 156 Fifth avenue. He spoke enthusiastically of the objects and purposes of the new association. The constitution and by-laws

FIRE CLAY BRICK

STAR SILICA BRICK

CORNERS *in* QUALITY

We have have "cornered" the brick market—so far as **Quality** is concerned. It's an interesting story—but we have only space to outline it here :

The first chapter begins at the clay-mines. It shows how particular we are about **good raw material.** The grading is very thorough. At every step—inspection—selection—rejection, until our experts have the cream of the clay beds picked **out.**

The last chapter is a long way from the first—for it takes longer to wear out **Harbison-Walker Refractories** than any other fire-brick made.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

This is a true story—you can see the proofs any time in this office; letters from users of refractories who have set down in black-and-white facts and figures which are the most valuable records of experience ever collected in the history of fire-brick manufacturing.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

1,100,000 DAILY CAPACITY
7,000 REGULAR CUSTOMERS

No Order Too Small for Our Best Attention. None Too Large for Our Capacity.

WE HAVE EXPERT KNOWLEDGE FOR YOUR BRICK TROUBLES
ALWAYS STATE FOR WHAT PURPOSE BRICK ARE TO BE USED

SEND FOR CATALOGUE "C"

MAGNESITE BRICK

Harbison-Walker Refractories Co., Pittsburgh, Pa.

CHROME BRICK

of the association were published in the December issue of Cement and Engineering News.

At the office of the Consolidated Rosendale Cement Company, 26 Cortlandt street, the report was made: "Just now news is scarce. It is too near the opening of the new year. Come in later."

The Reinforced Concrete Construction Company, 10 East Twenty-third street, has installed another United concrete mixer.

At the office of the Ransome Concrete Machinery Company, 11 Broadway, business matters were reported in satisfactory condition. The Turner Construction Company, which erected the reinforced concrete office and warehouse building for the Robert Gair Company, Brooklyn, used Ransome machinery in the work and as usual gave satisfaction. The Gair building is considered one of the most fireproof and up to date structures in Brooklyn, and is an attraction duly pointed out to visitors. The Gair Company manufactures paper boxes and specialties.

While granite and marble dealers are not exactly "agin" concrete, most of them decline to "boom it"—a procedure quite natural, all things considered. But in the Metropolitan building, 1 Madison avenue, your correspondent interviewed a marble man who sells Barre, Vt., granite, etc., and he said frankly: "Concrete is unquestionably the thing for middle class people who want to build, and it is destined to become very popular. It has a great many things to recommend it. Can you tell me if concrete manufacturers can use marble dust in making their blocks?"

In an interview with R. Baffrey, manager of the New York office of the Hennebique Construction Company, 1123 Broadway, he referred with satisfaction to many large armored concrete contracts successfully completed, many of which have already been fully described. The company has just been awarded a contract for the construction of a ten story apartment. It will be 75 by 75 feet, of completed is the stable of the United States Express Company North Jersey City, which cost $70,000. It has 42,000 square feet of space; was two months building; has spans 25 by 28 feet; is of skeleton construction, with tile colored blocks. The building is 150 by 300 feet and one story high. Actual work is now going on in the erection of the storehouses for the Standard Table Oilcloth Company at Buchanan, N. Y. The walls are five inches thick, reinforced, and there is no wood in the edifice.

H. G. Clark of the Penn-Allen and Non-staining Cement Company (Lafarge cement), 156 Fifth avenue, said trade conditions as he finds them are satisfactory. "Our non-staining cement," he said, "is particularly useful in the setting of fine marble. In facing concrete blocks it gives a nice, even color. It is popular with monumental dealers. The outlook for business is promising." The retail price of non-staining cement is $3 a barrel. Among firms recently ordering it in quantities are: V. H. Krigshaber, general builder, Atlanta, Ga.; Southeastern Lime and Cement Company, Charleston, S. C.; and Alfred Hiller & Co., general builders, New Orleans, La.

Bloomer Brothers of Newark, N. Y., heretofore extensive manufacturers of paper boxes and paper specialties, will go into concrete block manufacturing.

In a trade chat William G. Hoover, local representative of the Hudson (N. Y.) Portland Cement Company, siad: "Trade is very good, both in the city and out. It is our company's policy to sell to cement dealers rather than to sell to builders." Over 60,000 barrels of the Hudson company's cement will be used in the construction of a new textile mill at Lawrence, Mass.

The Rutherford (N. Y.) Cement Construction Company manufactures both concrete blocks and concrete brick and is understood to have a number of good orders on hand.

Harry H. Tillinghast is interested in the new Queens County Concrete Stone Company, Richmond Hill, N. Y., and Henry Escher, Jr., 68 William street, this city, is interested in the recently formed Ajax Reinforced Concrete Company of White Plains, which will do concrete work and building. It is capitalized at $25,000.

MANHATTAN.

PHILADELPHIA LETTER.

[Correspondence Cement and Eng. News.]

Building operations in Philadelphia during 1905 reached a record mark. Over 17,000 permits were issued and over $35,000,000 was expended in new buildings—the largest amount spent in the last ten years. The cement and concrete trade say the year's operations show a decided increase in concrete structures erected and prove that concrete is fast becoming popular as a building material.

Cement manufacturers report a fair increase of 1905 over 1904 business and seem to think business this year will be satisfactory. Sales were quite brisk up to the holidays, the weather permitting building operations to be continued, but at present writing the market is quiet. Manufacturers of concrete machinery express satisfaction with 1905 business and predict brisk spring trade.

Local quotations on cement, dealers' prices, are as follows: Rosendale, in wood, per bbl., 85@95c; German Portland, per bbl., $1.90@2.15; American Portland, per bbl., $1.53@1.65; in bags, $1.23@1.35.

That concrete forms an important material in building construction is shown by the following operations in and about Philadelphia: The Lehigh Valley Railroad Company will erect a $50,000 station at Hazleton this spring to be constructed of concrete blocks. The Ford & Kendig Company, in putting in a new floor at their 1428 Callowhill iron warehouse, selected armored concrete as being both strong and fireproof. Friehofer Brothers, bread bakers, will erect a new baking plant on Clearfield street, to cost $250,000, to be constructed of reinforced concrete. The Kolb Estate, bread bakers, it is reported, will build a large concrete addition to their Broad and Butler street plant. The virtual completion of the reinforced concrete addition to the Marlborough-Blenheim hotel at Atlantic City, N. J., has directed much attention to concrete as a building material for hotels. It is said the Atlantic City edifice is the largest hotel structure built of concrete in the world. It is 125 by 560 feet, nine stories high, with a fifteen story dome. Seaside resorts like Atlantic City are subject to dampness and moisture which penetrate ordinary building disagreeably. Concrete, credited with being impervious to moisture, led the proprietors of the new hotel to select it as a desirable building material and it is said they will in no way be disappointed. The Atlantic City structure was built by the Trussed Concrete Steel Company of Detroit, Mich., the Kahn system of construction being employed and the work being done in six months. Concrete is to be largely used in a new resort hotel to be erected at Cape May, N. J. Merritt & Co., agents for the wire reinforced concrete construction system, 1024 Ridge avenue, are erecting an addition to their large branch plant at Front and Arch streets, Camden, N. J. The building is now five stories high; rods were used in reinforcing columns and girders, and brick is being used to face facade. As a part of the warehouse will be piled with heavy iron, metal lockers, etc., it shows Merritt & Co.'s confidence in the strength of reinforced concrete construction.

The Vulcanite Portland Cement Company, Land Title building, secured an order for 12,000 barrels of cement the past month to be used in continuing work on the subway and elevated street railroad. It is the intention of the Rapid Transit Company to complete the West Philadelphia extension if possible within three months.

Robert W. Lesley, president of the American Cement Company, is also president of the Reliance Cement Company. At Allentown, Pa., the past month, the Reliance Cement Company entered a mortgage for $600,000 in favor of the Equitable Trust Company of this city. The mortgage was given to secure bondholders investing in the new industry. At Egypt, Pa., in the heart of the cement belt, the Reliance Portland Cement Company is building a cement manufacturing mill. The American Portland Cement Company has a mill at Siegfried. It has been running steadily the past year. Treasurer F. J. Jiggins of the American company is mailing checks to stockholders in payment of the thirteenth semi-annual dividend of 3 per cent, declared the past month.

In the local courts this month the Vulcanite Paving Company, a local company, recovered a judgment for $9,000 against Daniel J. and James P. McNichol and Israel W. Durham, contractors, for paving the Northeast boulevard. The Vulcanite Paving Company was sub-contractor and did the actual work. Israel W. Durham was former political "boss" of Philadelphia; under him the McNichols were "favored" contractors. The Vulcanite Paving Company sued to recover for work done for the McNichols; they refused to pay, contending they should not pay until they were paid by the city. The court held otherwise. The Vulcanite Paving Company has offices on the nineteenth floor of the Land Title building and is said to be allied to the General Asphalt Company. The paving company does a great deal of concrete curbing and sidewalk work.

George N. Johnson, Uniontown, Pa., is interested in the Maryland Wood Fibre, Plaster and Supply Company, which bought the Narrows paper mill at Cumberland, Md., and is remodeling it for the manufacture of concrete blocks, tiles, wood fibre, etc. Charles D. Willard is secretary of the new company, which has offices at Cumberland and is capitalized at $50,000.

A. M. May, C. B. Rockwell, and H. J. Rockwell, Camden, N. J., trading as the American Vitreous Company, will deal in cement and building materials.

Harmon S. Palmer of the Harmon S. Palmer Hollow Concrete Building Block Company, Washington, D. C., was a recent visitor. He sold county rights to use the Palmer machines to responsible parties in Camden county, N. J., and sold two concrete block machines to George A. Aldrich, Philadelphia, who will manufacture blocks.

Said a Land Title building cement manufacturer: "Cotton bags are so expensive cement manufacturers are having burlap bags made as an experiment and, if they answer the purpose, will be substituted for cotton bags."

The Lamb Patented Railroad Tie Company held a meeting at Mt. Holly, N. J., the past month, at which a report was made that concrete ties, reinforced with rods, laid on the roadbed of the Pemberton and Hightstown railroad (a local railroad) had given excellent satisfaction. It seemed to be the opinion of those who inspected the ties and watched the experimental test that they have proven successful. The report set forth that such concrete ties, reinforced with rods, while more expensive at first cost, last four times as long as ordinary wood ties. It is said the Lamb company expects to manufacture these concrete ties on a large scale; that several transportation companies promised, if the ties proved practical, to give the Lamb company good orders. Assuming the Lamb tie is a success—but of that there seems some doubt—it is quite probable they will be used by many railroad companies, inasmuch as the latter admit the time is near when timber ties will be high priced and hard to get. The Pennsylvania railroad has planted trees in order to insure future tie necessities, and east of Lancaster, Pa., the company is laying a 1,000 foot experimental steel tie and concrete roadbed strip to ascertain if such roadbed can be successfully used in its Hudson river tunnels, now building.

Said a representative of the William Penn Silica Works: "We are very busy at the mills in Montgomery county. We are in the market for a stone grinder and pulverizer." The company supplies sand and crushed stone for concrete-block manufacturers and builders. The company's address is William Penn, Montgomery county, Pa.

The Frankford Cement Stone Company is building a one story factory on Powder Mill lane, Twenty-third ward. Concrete blocks will be manufactured. The Philadelphia Cement Company is building a $1,200 factory at Eighty-fifth and Grove streets.

T. M. Simpson, appointed Philadelphia salesman of the Weber Steel Concrete Chimney Company of Chicago, has taken office at 1632 Land Title building, and is giving business matters close attention.

The Consolidated Concrete and Construction Company, incorporated at Camden, N. J., last October, with office at 1118 Chestnut street, Philadelphia, is no more. According to an officer of the defunct company the promoter of the project made off with things he did not own. The company is to be reorganized, this officer asserted.

Walter L. Webb, local representative of Johnson's corrugated bars for concrete construction, has closed a contract to supply 125 tons of bars for a local reinforced concrete construction building operation.

The Schuylkill Stone Company, 1007 Pennsylvania building, has purchased 3,000 acres of stone land near Birdsboro, Pa. The stone is said to be suitable for building or concrete manufacture.

The local office of the McKelvey Concrete Machinery Company, Heed building, reports sales of a number of machines the past month.

C. P. Calver of the Contractors' Tool Company, 104 Arch street, reports an increasing demand for cement workers' tools; 1905 business was very satisfactory.

The Wickes Brothers' agency, ma-Tool Company, 704 Arch street, received the order to supply cement rolls for the new mill of the Lehigh Portland Cement Company, two miles west of Chapman's station, Lehigh county. The new mill's capacity will be 4,000 barrels a day.

The so called Trexler syndicate, which owns 800 acres of land near Fogelsville, Pa., has decided to erect a 5,000 barrel Portland cement mill on its tract.

Two new concrete companies incorporated at Camden, N. J., the past month, the Columbian Reinforced Concrete Company and the National Concrete Stone Company. So far both are said to be "paper" companies.

Philadelphia members of the Association of American Portland Cement Manufacturers who attended the annual meeting at New York last month express gratification at the outcome of the annual election and "good time" had. No technical papers were read at the three days' session, but informally trade conditions were discussed and sociability encouraged. President J. B. Lober was gratified at the souvenir presented him and his reelection for another term. He has given painstaking care to the asociation's welfare.

At the Builders' Exchange, 21 South Seventh street, exhibits of concrete work, blocks, machinery, etc., are made by the National Art Stone Co., Twelfth and Welsh streets, Chester, Pa.; the Keystone Concrete Block Company and the American Art Marble Company, 609-613 North American street. Manager Smith of the Keystone Concrete Block Company is on hand daily at noon to explain the workings of his block machine. The National Art Stone Company of Chester is developing a good trade in concrete mantels, hearths, columns, etc.

Philadelphia capital is said to be interested in the Continental Concrete Company of Pittsburg, which incorporated the past month with $50,000 capital. H. F. Haas of the First National bank, Pittsburg, is treasurer.

The Whitehall Portland Cement Company, Land Title building, issued a neat "engagement" notice this month wherein the company "engaged" to give good satisfaction to buyers. This company prints "Cementology," a "house publication" of merit.

A number of local cement users attended the annual meeting of the National Association of Cement Users at Milwaukee January 10-13. Now that New York has a local association of cement users, interested parties here would like to see a similar organization in Philadelphia.

"So far as I can see," said a Land Title building cement manufacturer, "there will be a good local demand for Portland cement this year. The extension of the rapid transit subway from the City Hall to the Delaware river is one building operation which calls for vast quantities of cement and there are a number of other large operations I do not now care to mention, in addition to many building operations."

The trial of John W. Hill, ex-chief of the filtration bureau of Philadelphia, charged with 130 specific allegations of forgery and falsification of public records, which commenced here January 2, is of deep interest to cement and concrete interests. Hill supervised the building of the Torresdale filtration conduit.

WM. PENN.

NEWS OF THE PLANTS.

The Alma Cement Company has just completed two new stock houses, each 80x130.

The cold storage house of the Hull cement works at Hull, Quebec, was destroyed by fire Dec. 27, 1905. Loss, $25,000.

The Mahoning Builders' Supply Company of Youngstown, Ohio, will erect a plaster mill. Capacity, 100 tons per day.

Reorganization Company General. Capital stock, $100,000. Incorporators, Amos Ellis, Henry G. Swayne, Philadelphia, Pa.

The Elk Rapids Portland Cement Company closed down on December 10 on account of shortage of cars. Work will be resumed in February.

Standard Portland Cement Company of Charleston, S. C., incorporated recently with $125,000 capital stock, will manufacture Portland cement.

The average output of the Alpena Portland Cement Company for 1905 was 1,000 barrels per day. The largest day's run was 1,800 barrels in twenty-four hours.

The Philadelphia Concrete Company. Capital stock, $100,000. Incorporators, Richard McMurtrie, Frederick A. Sherwood, Bascom Johnson, Philadelphia, Pa.

Crown Cement Works Company, Trenton, incorporated to manufacture Portland and other cement, lime, limestone, plasters and artificial stone; capital, $25,000. Incorporators; H. H. McClure, George R. Work, E. Kern, all Trenton.

Chas. M. Figley, late head bookkeeper of the Pacific Portland Cement Company at Suisin, Cal., has been arrested, charged with appropriating the company's money. The charge is denied by the accused.

The Castalia Banking Company is promoting a Portland cement plant at Castalia, Ohio. Options have been obtained on 320 acres of marl lands opposite the holdings of the Castalia Portland Cement Company.

CEMENT MILL MAY MOVE.

The next meeting of the National Portland Cement Company's shareholders promises to be an interesting one. The directors of the company have recommended the removal of the company's mill from Durham, Ont., on account of the scarcity of raw material in that locality. The town council of Durham disputes the statement that material is scarce, and a committee appointed by it, under the chairmanship of Dr. Jamieson, M. P. P., investigated the question and reports that there is a sufficient quantity of marl obtainable to keep a cement mill running for a man's lifetime.

The company was capitalized at one million dollars, a quarter of a million of which went to the promoters. A mill was constructed with a capacity of 1,000 barrels a day, and said to be one of the best mills on the continent. In the building of it, however, a liability was incurred, which was increased by inexperience of workmen and accidents during the first year. No dividends being forthcoming, the stock fell to 16 cents on the dollar.

This last year things went very much better, and the company was enabled to pay back $13,000 which had been borrowed from the bank, and to reduce the indebtedness from $127,000 to $30,000. On the top of this favorable report the citizens of Durham, who are largely interested in the company, were thrown into consternation by the resolution of the directors to move the plant elsewhere.

At the annual meeting of the Peninsular Portland Cement Company, January 16, the following officers were elected: President, W. F. Cowham; secretary, J. W. Shove; treasurer, N. S. Potter. The following directors were elected: M. B. Sweeting, F. E. Palmer, W. C. Anderson, Detroit; D. C. Griffin, Ypsilanti; H. Frank Stone, Rochester; Jacob Foerster, Ypsilanti; W. H. Niblick, Decatur, Ind.; W. W. Hawley, Huntington, Ind. Over sixty stockholders were present. Suitable resolutions were passed touching the death of W. B. Bogardus, late chief engineer of the company.

Crown Cement Works Company, 147 East State street, Trenton, N. J.; manufacture Portland and other cement, lime, limestone, plasters, and artificial stone; capital, $25,000; incorporators, H. H. McClure, George R. Work, and E. Kern, all as above.

The Globe Cement Company, whose plant is at North Jeffersonville, Ind., has a stockholders' quarrel; two sets of officers have been elected. Herman Preefer has been recognized by the courts as president, against Dr. G. Oscar Erni, who claims the office and has not abandoned hope of being installed.

The Marquette Portland Cement Company has elected the following officers: President and treasurer, N. W. Duncan; vice president and general manager, T. G. Dickinson; sales manager, William Dickinson; general counsel, George M. Eckels; secretary, Edward J. Dalton; assistant treasurer, Stuart Duncan. James H. Eckels, William Dickinson, V. J. Duncan, T. G. Dickinson and N. W. Duncan were chosen as directors of the company for 1906. Extensive additions to the plant will be made in the near future.

International Armored Cement Company, City of Mexico, Mexico, to manufacture, deal in and sell all kinds of cement; capital stock, $400,000. A Delaware charter has been obtained.

The Stockholders of the ElCajon Portland Cement Company at a meeting in Au Sable, Mich., Wednesday elected directors as follows: W. E. Rogers, Jonathan Palmer, Jr., John M. Parker, E. E. Perrin of Detroit, Selig Solomon, R. A. Richards, John McKinney, George B. Loud, H. K. Loud of Au Sable.

The American Cement Company held its annual meeting in Camden yesterday, when these directors were elected: George W. Norris, John H. Catherwood, Alton H. Reed, Edward Wolf, Charles S. Farnum, Frank G. Thomson, R. W. Lesley, J. W. Eckert and George H. B. Martin.

Alpena Portland Cement Company election of officers: President, Herman Besser; vice president, George B. Holmes; secretary, Chas. H. Reynolds; treasurer, W. H. Johnson; auditor, Chas. H. McKim. The new directors are as follows: Herman Besser, Wm. H. Johnson, Chas. H. Reynolds, George B. Holmes, Chas. H. McKim, F. W. Gilchrist, F. W. Fletcher, W. S. Russel, Detroit, Patrick Culligan.

The plant of the New Castle Portland Cement Company is almost completed and will be ready to begin operations within four weeks, says the New Castle News.

The Pacific Concrete Machinery Company, 321 Market Street, San Francisco, is introducing a cement post machine which produces a cement post at from 15 to 16 cents per post. The cost of the machine is $40.00 complete.

WANTED AND FOR SALE ADS.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

POSITION WANTED.

A thoroughly practical cement chemist is open for engagement. Technical training and mill experience. Address Box A. O., CEMENT AND ENGINEERING NEWS.

POSITION WANTED—Technical cement chemist and engineer of the broadest experience in cement manufacture, desires position. Address "Experience," care of CEMENT & ENGINEERING NEWS.

CEMENT CHEMIST

Five years' experience on both wet and dry process with marl, limestone, clay and shale, desires position. Address "W. L.," care of CEMENT AND ENGINEERING NEWS.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

WANTED

Position as Chemist after January 1, 1905. Have had five years' experience as Chief Chemist of one of the largest and most up-to-date cement mills in the United States. Best of experience furnished. Address "A. B. C.," care CEMENT AND ENGINEERING NEWS.

WANTED

CEMENT CHEMIST, with seven years' experience in Germany and this country. Familiar with dry and wet process, desires change. Address M. G. 30, care Cement and Engineering News.

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A Monthly Journal of Practically Applied and Analytical Chemistry, Edited by Richard K. Meade.

Contains frequent papers on the manufacture, analysis and testing of Portland Cement.

Is a good advertising medium for grinding machinery, conveying machinery, fire bricks, etc.

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WANTED—Position as Superintendent or Constructing Engineer. Graduate M. E. with several years' experience in design, construction and operation of wet and dry process cement plants. Now superintendent of plant. Open for position after January 1st. Best recommendations from former employers. Address "Superintendent," care Cement and Engineering News.

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"Portland Cement Sidewalk Construction"

Based upon the experience of many successful contractors.

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226 La Salle St., CHICAGO, ILL.

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For Grinding
RAW MATERIALS, CLINKER AND COAL

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ARE THE RAW INGREDIENTS WHICH MIXED IN THE PROPER PROPORTIONS MAKE THE

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General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.

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There's a question Contractors, Builders, and al who have to do with building may well ask themselves.

The enormous use of Cement Stone in buildings of all kinds during 1905 has compelled the conservatives in the building trade to "sit up and take notice."

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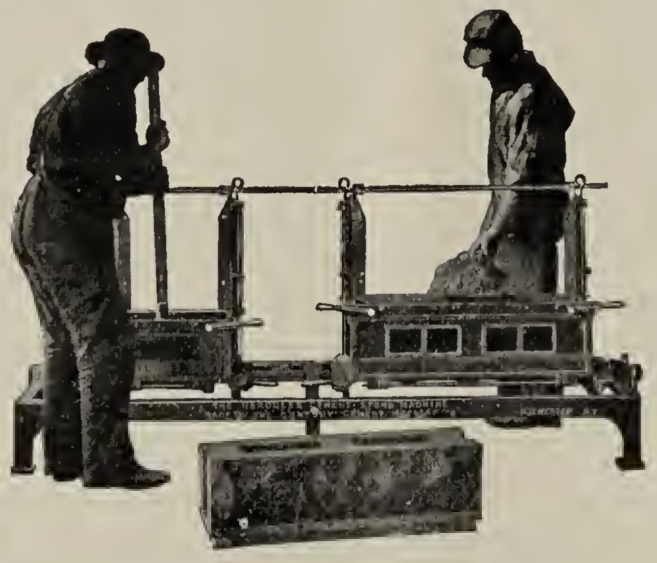
Men with foresight in the building trades all over America, and even across the sea, are falling in line, and are looking for the best Cement Stone Machine made.

In choosing a Cement Stone Machine don't be carried away with the vociferous shouting and constant clamoring of manufacturers who claim without reason, that their machine is the best, or even "Better than the Best."



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NOT BETTER THAN THE BEST
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A fact that is easy to prove to any intellectual Builder or Contractor who will take the trouble to write for our new beautifully illustrated Catalog G.

The simplicity of construction in the Hercules is one great feature; this combined with its automatic action and accurate mechanism and the combination arrangement which permits two stones of different sizes to be made on the one machine at the same time, is the reason that the Hercules makes more blocks in less time and for less money than any other machine.

The Hercules is an adjustable machine—perfectly and easily adjustable—and that is why it can make blocks ranging in size from two inches to six feet, accurately and perfectly.

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MADE ON HERCULES

Tamping directly on the face also permits the builder to make a stone with a fine clean-cut face and a coarse back—a clear saving of material.

If you are going to own a machine, you will want the one that will make the strongest blocks—blocks with a crushing strength equal to natural stone.

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You can smile at competition if you have a Hercules; smile right out loud if you choose, for you can make blocks much cheaper, much stronger, much more natural looking than any competitor who uses any other machine.

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Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

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Densitor can be furnished in various colors and tints (made to order only).

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One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

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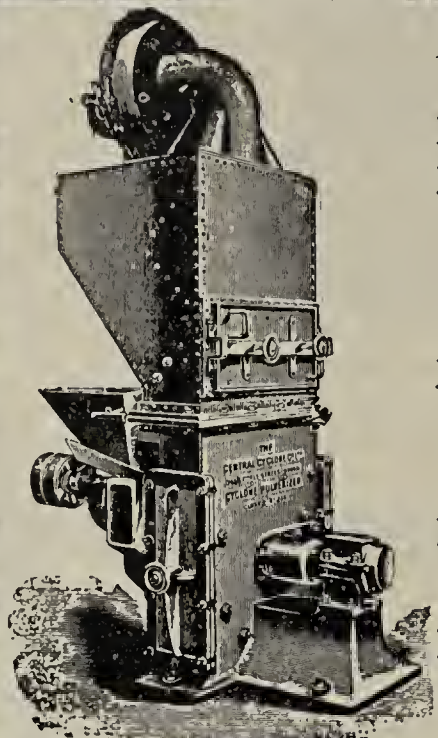

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NO DRYING OF THE COAL is required before grinding unless it contains more than 15% of moisture. The AIR used absorbs and carries off moisture.

RECEIVES COAL in pieces of large size and reduces it quickly to powder.

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A Larger Output Per H. P. Than Any Other Machinery in the Market.

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Nothing to Clog, Break,
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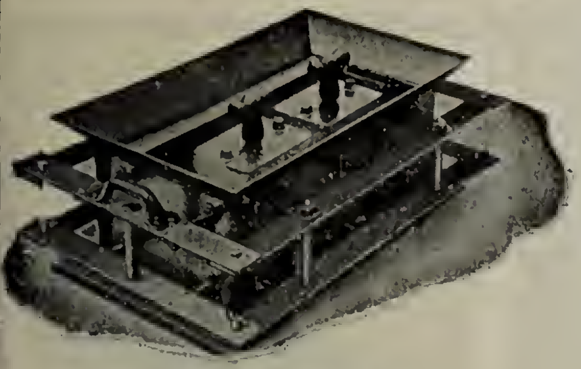

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No Other Method Approaches It in Any Particular.

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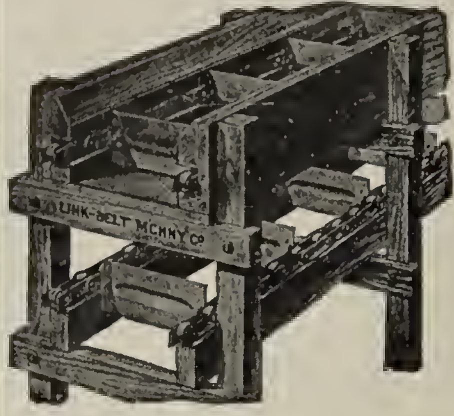

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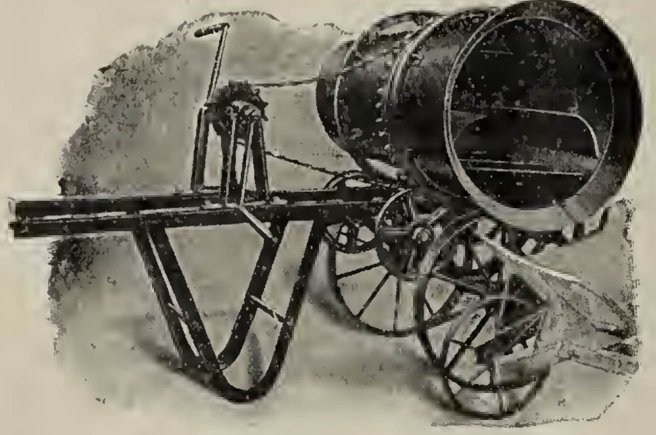

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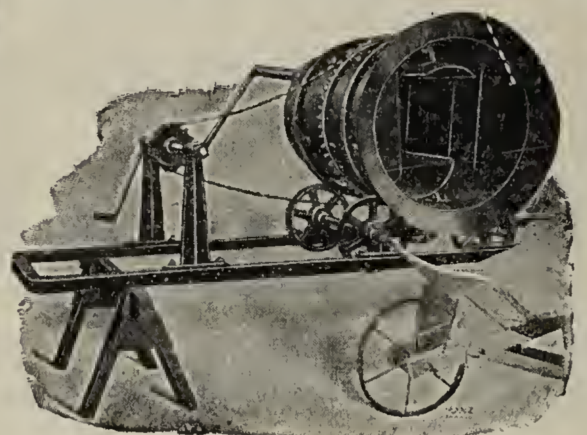

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172 pages. Illustration and Diagrams 217 Pages.
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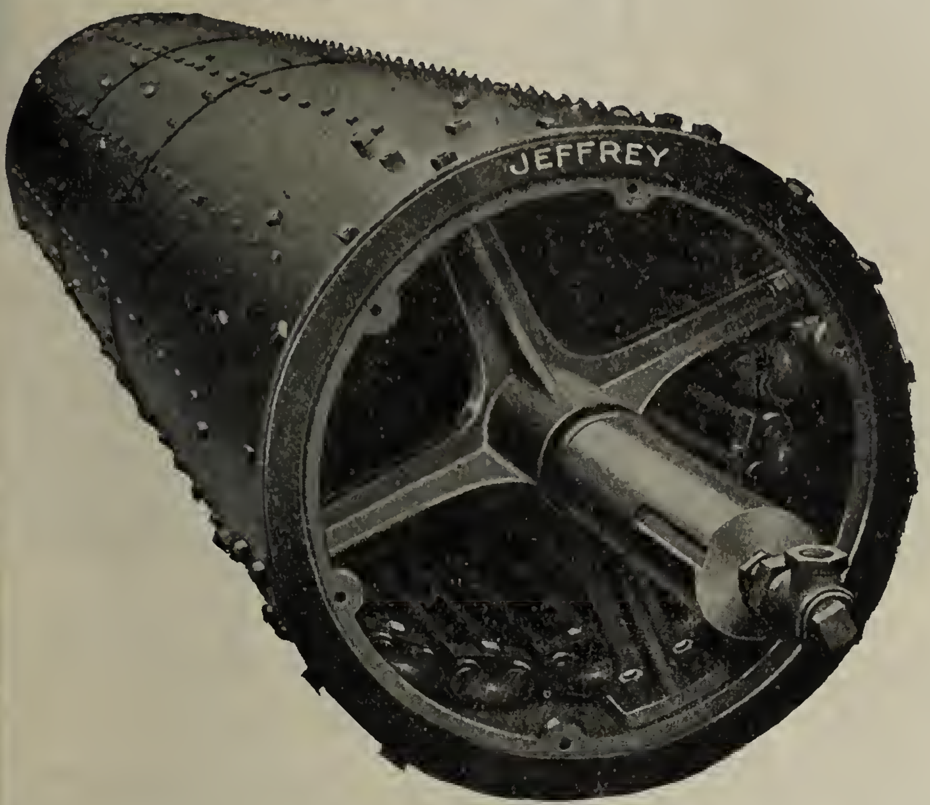

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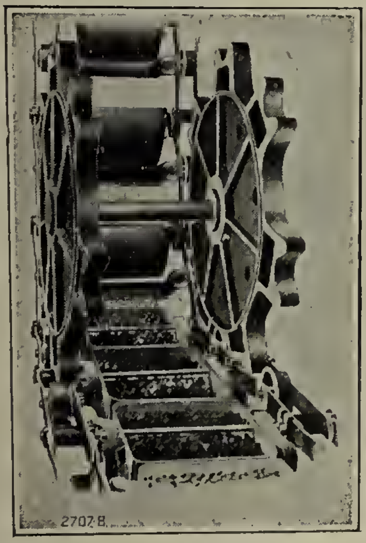

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[From the German of L. Gollinelli.]

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"DAS KLEINE CEMENT-BUCH."

Translated by S. B. NEWBERRY.

Twenty-Three Thousand of this publication sold in Germany in three months.

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Sent to any address on receipt of price.

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The Cement Workers' Hand Book

Tells you what Cement is, its nature. And proper methods in the making of Mortar and Concrete. Also how to reinforce Concrete with Metal. In a most simple way it describes over 50 subjects of construction. The book is in 5 parts and contains more than 30,000 words. Sent to any address postpaid on receipt of 50 cents. Address

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PERSPECTIVE.

PERSPECTIVE OF

Hollow Concrete Building Block Residence

We will send you this perspective drawn to one-quarter inch scale, with one-sixteenth inch scale drawings of floor plans in corners on white paper with blue lines, upon receipt of "One Dollar." Perspective is 20 inches by 18 inches. This picture displayed on your walls will help you make sales. Address

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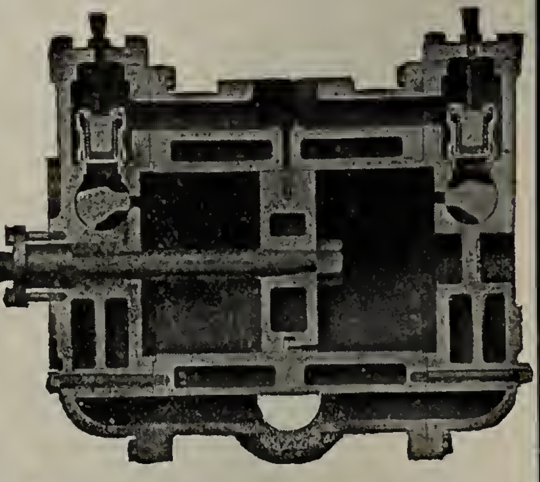

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MECHANISM OF
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permit us to reduce both the weight and the space occupied, also securing noiseless operation and increased efficiency.

Full particulars are given in our

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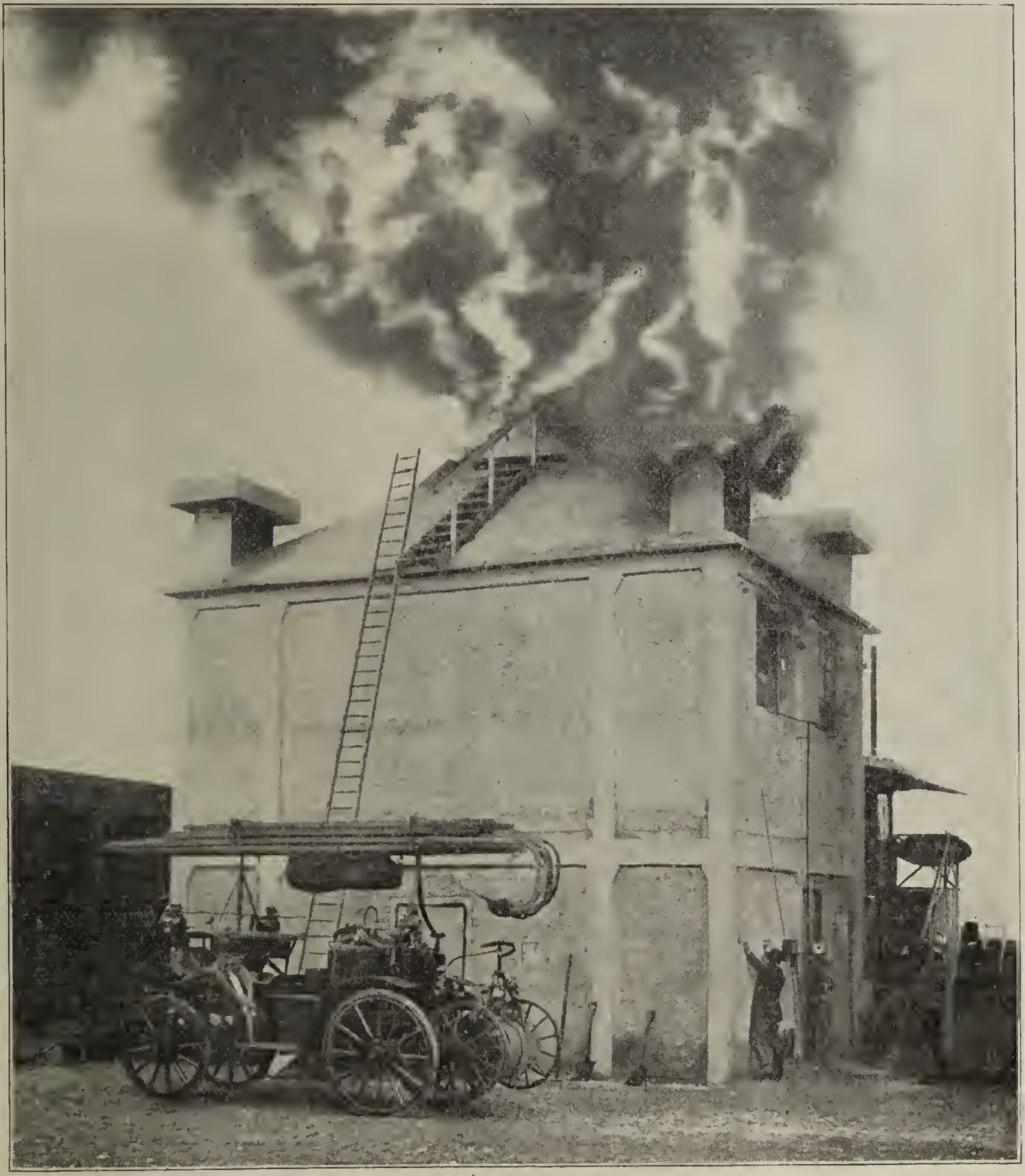

Fig. 3. Model Reinforced Concrete Theater, Erected for the Austrian Society of Engineers and Architects, for the Purpose of Studying Theater Fires. Ventilators All Open, Curtain Down. See Page 34 for Description.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
OFFICE—226 La Salle Street.
Cable Address—"Seafert," Chicago.

Entered at the Post Office at Chicago and transmitted through the mail as Second-Class matter.

SUBSCRIPTION. - - - - $2.00 PER YEAR
FOREIGN SUBSCRIPTION, - - 2.50 PER YEAR

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"This world belongs to the energetic."

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, FEBRUARY, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

CONVENTION NOTICES.

The Cement Users of Iowa and Minnesota will meet in convention at Mason City, Ia., on March 21, 22 and 23. A large attendance is expected.

The Cement Market.

From present indications high prices will rule the cement market during the approaching season, in sympathy with the higher ruling prices for all other building material.

The leading railways have been preparing for largely increased traffic, shown by the large orders placed with private car builders, while their own car shops are being worked to the limit.

Orders placed with steel mills for structural steel and rails exceed all previous demands. The Illinois Steel Co. alone expect to produce 38,000,000 tons this season. This points to an equally heavy demand for cement. The cement mills have the market well in hand and refuse to quote prices for future deliveries beyond 30 days.

Present prices seem to be fair when compared with local European prices. Business has never been more promising for the mills notwithstanding the large increased capacity of the old mills and the new mills coming into operation.

The combined output will find a ready market at such figures as the mills choose to make.

New cement mills are springing up in various parts of the country, stimulated by the high prevailing prices of last season.

Promoters who thrive on selling stock instead of engaging in legitimate manufacture, are again in clover. Selling stock under tempting and alluring offers of great profits to investors, which are never realized. The investors expect to obtain something for nothing. Cement is to be produced at about 50c per barrel and sold for $1.25 and over at the mill. As a rule the more tempting and alluring the proposition the more danger to the investor.

The cement mills have the future legitimate development in their own hands. If they will simply stand for fair prices, new mills will find no extraordinary inducement to enter the field. It will be good policy for the consumer to lay in large orders as early as possible, as prices are likely to go up every thirty days during the season.

WASHINGTON PORTLAND CEMENT COMPANY.

The Washington Portland Cement Co., now nearing completion, is located in Skagit county, Washington, on the Skagit branch of Great Northern Railway, between Anacortes and Rockport about 104 miles northeast of Seattle. The company has three side tracks from the main line to the plant. The raw material consists of limestone and shale. The lime rock is located 1,500 feet from the plant and will be brought to the mill by an electric road. The shale deposit is 500 feet from the plant. The company is constructing a dam across the Baker river, and a flume 6 by 10 feet, three miles long from the dam to the power house which will develop 3,000 H. P. Ball and tube mills are being installed for the raw and finished ends. A No. 6 Gates crusher will be used for reducing both the rock and shale. Crude oil fuel will be used for firing the kilns. Two 100-foot rotary kilns will be used at the start. As soon as the plant is in operation two additional kilns will be installed. It is the intention of the company to bring the capacity of the plant up to 3,000 barrels per day by adding two kilns at a time. All machines of any size will be driven by individual electric motors. The company likewise intend to erect limekilns; the lime to be shipped in carloads to Seattle. Mr. N. L. Warford, late of the Standard Portland Cement Works of Napa Junction, Cal., is the superintendent of the plant. The following named persons are the officers of the company: A. W. Middleton, president; A. S. Austin, vice-president; S. M. Anderson, treasurer; E. E. Caine, secretary, and E. C. Miller, general manager. One hundred men are employed on the construction of the plant. The mill is to be operated by the last of April. The postoffice address of the Washington Portland Cement Co. is Baker, Skagit county, Washington.

The Durable Cement Butt, of Battle Creek, Mich., capital stock, $300,000, has been reorganized with a capital stock of $2,000,000, by C. D. Cramp of the Cramp Shipbuilding Co. of Philadelphia and other prominent steel and telegraph capitalists.

A NEW MEXICAN CEMENT PLANT.

The Henry S. Spockman Engineering Co., of Philadelphia, Pa., are preparing plans and specifications for a cement mill to be erected at Hidalgo, Nuevo Leon, Mexico. The plans are well under way. Contracts for machinery will be let in March. It is hoped to have the mill in operation by October. The plant will have a capacity of 1,000 barrels per day.

THE ELK CEMENT & LIME CO.

The Elk Cement & Lime Co. at its annual stockholders' meeting January 24th at Petoskey, Mich., elected the following directors: C. A. Whyland, S. W. Samson, E. R. Sly, M. B. Lang, H. Hirschberg, Robert Williams, Thomas A. Wilson, S. L. Robinson. The officers are:

C. A. Whyland, president and general manager.

E. R. Sly, vice-president.

M. B. Lang, second vice-president.

E. M. Sly, secretary-treasurer and general sales agent.

This company will start their cement plant in a few weeks for the season's run. They make the Rock Portland cement, and are the only plant located on Lake Michigan, with lake facilities for shipping.

NEBRASKA ASSOCIATION OF CEMENT USERS.

The above named association held its first convention at Lincoln, Neb., on February 14, 15 and 16. A constitution and by-laws were adopted. Mr. Richard L. Humphreys delivered an address. One hundred and fifty members were in attendance. The Western Cement Users' Association, heretofore organized at Grand Island, Nebraska, gave up its organization and united in a body with the Nebraska Association of Cement Users

MACHINE SALES.

The Ideal Concrete Machinery Co. of South Bend, Ind., have just shipped six machines to Manilla, P. I., and a single machine to Moro Proving, for the United States Engineering Department, to be used for making blocks for the provincial buildings to be erected at Zamboanga, Island of Miandanao. Machines have likewise been shipped to Liverpool, England. The company is likewise in receipt of inquiries from points in New Zealand, Australia, Cuba, South America and South Africa.

TESTING THE WATER-PROOF QUALITIES OF CONCRETE BLOCKS.

A few years ago when concrete blocks were first placed upon the market as a building material, the question of strength was perhaps the first to arise among the builders and the public. Were the blocks strong enough to resist the stress in a wall? To convince the public of this many tests have since been made, numerous specimen tests such as you have just seen before you, and even more important than this have been the structural tests, the large buildings which have been built of concrete blocks, that are still standing, and which we expect to stand for years to come. It is true that the stress in a block wall due to its own weight is only one pound per square inch per foot of height, and in a wall 200 feet high the stress in the lower courses due to the weight of the wall alone would be only 200 pounds per square inch, and with the ordinary block would give us a very large factor of safety. Thus we see that the question of strength is not such a serious one, but there is another more serious fault which we know hinders the use of the concrete blocks in many cases,—that of water penetration, or permeability of the blocks.

It has long been known that water will permeate ordinary masonry, and that plastering directly upon stone or brick walls had to be avoided. This is also a great drawback in concrete block construction, and at the present time it is generally considered necessary for the wall to be furred and lathed before plastering.

Builders have learned that even then, block construction, as regards cost, compares favorably with frame, and is cheaper than ordinary brick, and greatly under cut stone; but if it were possible to plaster directly on the inside surface the use of concrete blocks would certainly be greatly increased.

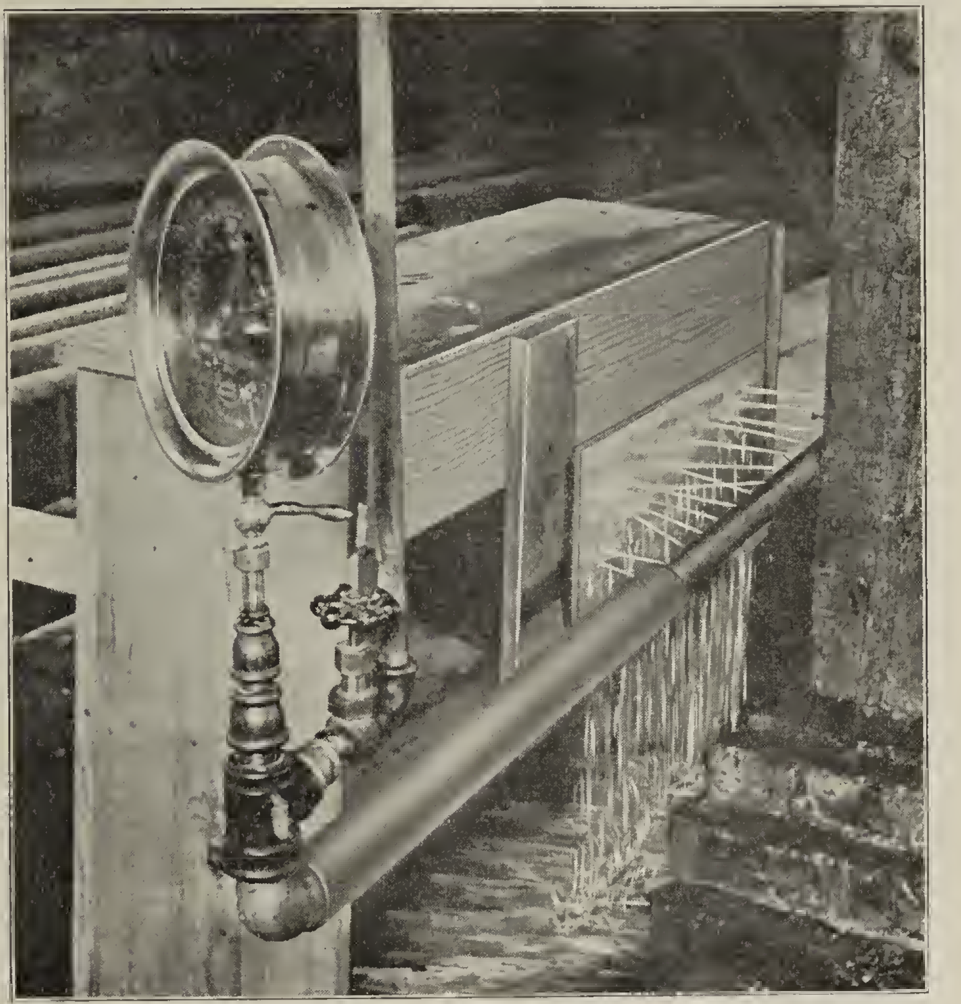
To avoid this fault of the ordinary concrete block many methods have been tried to prevent this excessive water penetration. The air space in the wall was the first perhaps, and the blocks with the single core, the double core, and the two-piece blocks have been tried. The methods of mixing, the damp, the wet, and liquid mixtures, and we have the hand tamped, the high pressure, and the poured blocks. To make the blocks less porous, rich mixtures have been used, but this is an expensive means; properly graded materials decrease the porosity but we cannot rely wholly on this. Again the use of a facing on the block, the impervious partitions, the waterproof compounds mixed in the cement, the use of lime in the mortar, the application of a wash or solution to the wall after it has been erected, and perhaps numerous other methods, all of which have particular advantages claimed for them, and which all have their places in overcoming this great objection to concrete blocks.

In order to test these various methods of making the blocks or walls impervious, and to determine the relative permeability of concrete blocks as compared to other materials of construction, we have endeavored to devise a test which would approach as nearly as possible the actual weather conditions to which blocks and other materials in a wall are subjected.

Before going further I wish to make clear a distinction between the porosity and permeability of a material. By porosity is meant the total amount of voids, but by permeability is meant the rate at which water will permeate or penetrate the material under a given pressure. A material might be very porous and yet water penetrate it very slowly. Thus permeability depends upon the size of the open spaces or voids as well as upon the total amount. Therefore any method of simply determining the porosity or amount of voids in a block would come far from giving us its relative value for use in a wall.

The illustration shows a test of a block in operation. The block is placed in this box, face out, just as it would be in a wall. The two sides of the opening, the upper and the left, are adjustable and can be fitted to any ordinary block. Extending around the block is a place for a mortar joint, ⅜″ thick by 1″ wide. This was filled with good Portland cement mortar and allowed to set for 15 hours. All the cracks at the corners and edges of the box, and all openings on the front side were closed with plaster of paris to make it impossible for water to get to the back of the block anyway except by going through the face.

The face of the block was placed 5″ from the spray pipe, which is a 1″ pipe arranged with openings 2″ apart and 1-32″ in diameter. By means of the valve it is possible to get any desired pressure in the pipe, which can be measured by the pressure gauge. In this particular test the spray was applied for 6 hours at a pressure of 2 pounds per square inch. At the end of three hours the water had just penetrated the 8″ of solid concrete. In 6 hours the entire block was wet, and upon weighing the block it was found that it had gained a little less than 6 per cent in weight.


Testing Waterproof Properties of Concrete Blocks.

This was a block of 1 to 4 mixture, single air space, size 8″x8″x 24″, was 5 months old, and when tested later in the transverse machine showed a modulus of rupture of over 300 lbs. per square inch.

Another block with the double air space was tested. In 3 hours it was wet about half way through and in 6 hours the top third behind the cores was still dry. This was a 1 to 4 block, size 8″x9″x24″. The block was 16 months old and showed a modulus of rupture of about 150 lbs. It gained a little more than 6 per cent in weight.

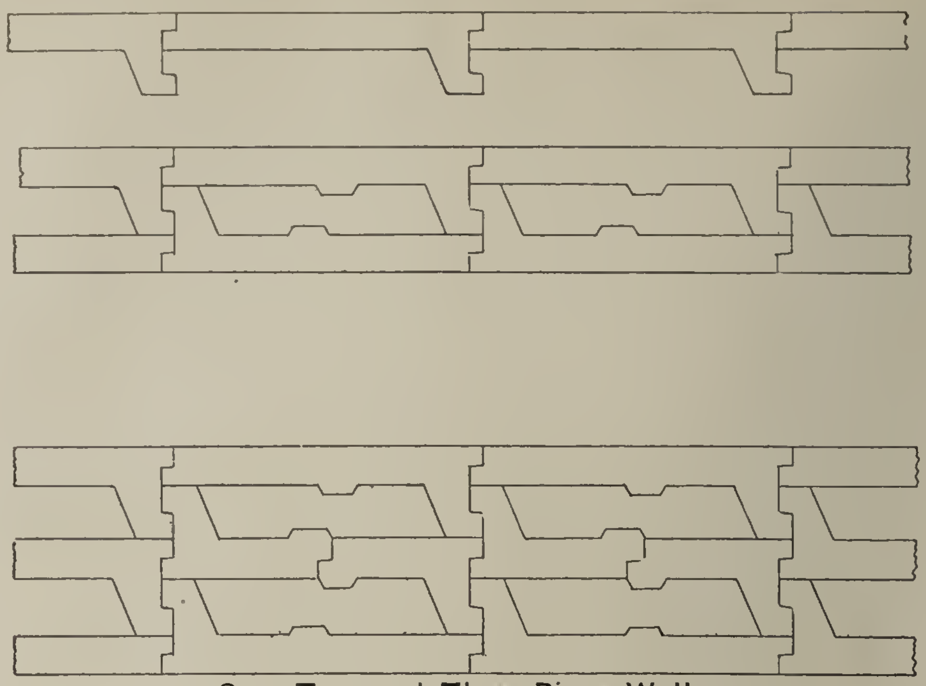
We expect to continue these tests

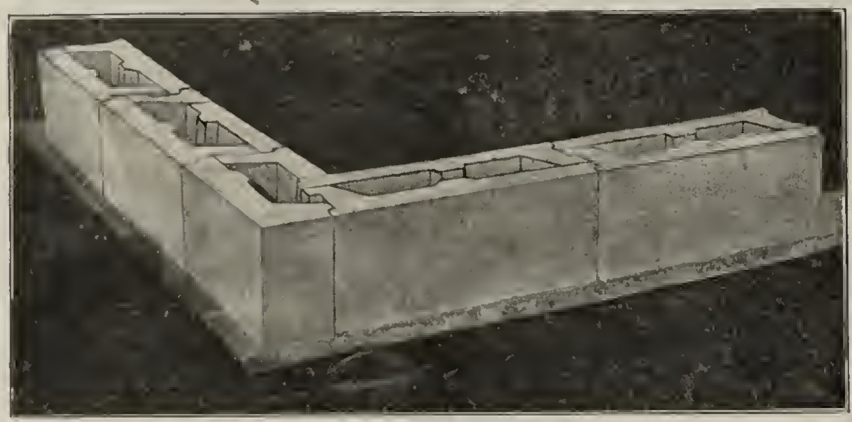
of the waterproof qualities of blocks, and later will make the same tests on other materials, such as brick and stone, by taking blocks about the same size from old walls and testing them in identically the same way.

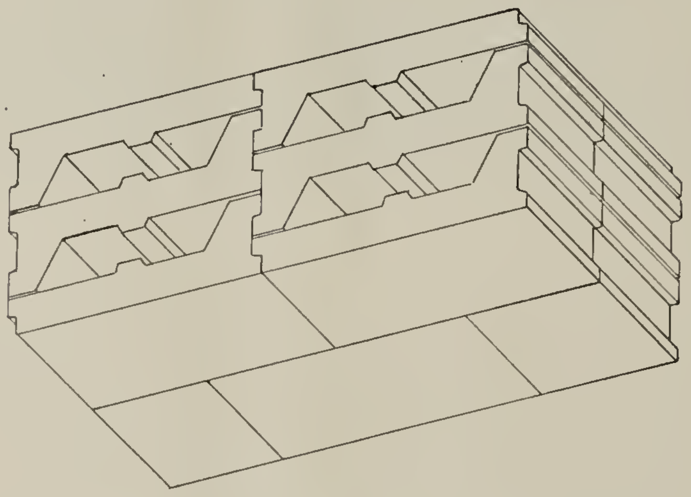
Here there is also a chance to test the various washes put upon the market and sold to builders to make their wall impervious. We expect to experiment along this line, to try a cement wash and in this and other ways see what can be done to better the waterproof qualities of concrete blocks, and thus bring the block industry into better favor with the public.

INTERLOCKING BUILDING BLOCKS.

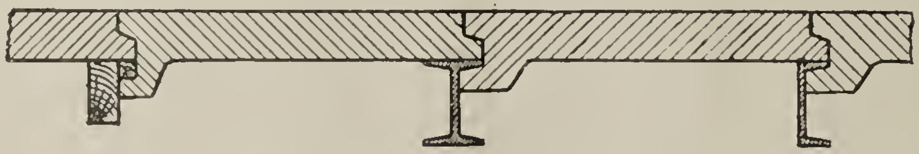
Mr. Joseph Schall of Chicago is the inventor and manufacturer of a two-piece interlocking concrete building block, illustrated by the following cuts. Fig. 1 shows a two-piece block wall. Fig. 2 a three-piece interlocking wall. Fig. 3 shows the blocks interlocking with a steel or wooden framing forming an outside wall. Fig. 4 is similar wall with sheething protected by tar paper. Fig. 5 shows the manner of assembling one-piece, two-piece and three-piece walls. Fig. 6 is a handsome block residence erected in Chicago. A six-flat building, three stories high, is now under construction in Chicago.


One, Two and Three-Piece Wall.

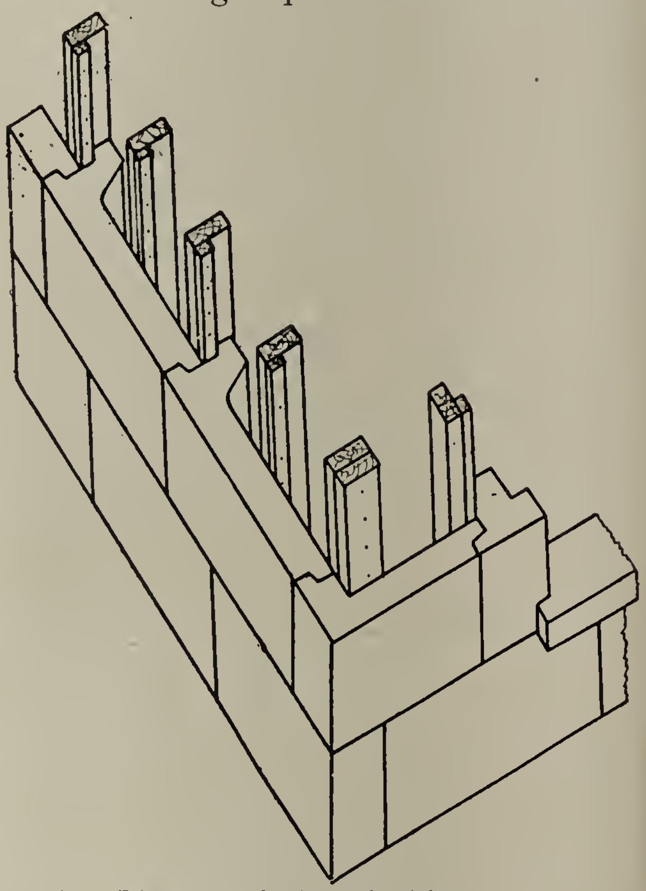

Two-Piece Block Wall.


Three-Piece Wall Construction.

These blocks are provided with a flange or projections placed respectively opposite each other. At the end of the flange and the end of the block flushed with the front face. At the rear end of the block is provided a projection flush with the inner face of the block. All as shown by the various illustrations.


Veneer Interlock with I Beams.

These blocks can be used as veneering for brick walls, the flange being imbedded in the masonry. The entire construction for the various kinds of walls make strong and ridged work. The machine producing these blocks is at once strong and simple in construction and can be easily operated, no cores being required. Cornice and coping blocks can be made on the machine. These blocks can likewise be used for roof covering in combination with channel and I beams. Catalogues and fuller information can be had by addressing Joseph Schall, 163 Randolph street, Chicago, Ill.


One-Piece Wall Interlocking with Wood Framing.

Mr. C. A. Whyland of Chicago has secured the controlling interest in the Elk Cement & Lime Company, in which he has held a minority interest until now. The cement plant is at Elk Rapids, Mich., and the lime plant at Bay Shore, Mich., while the general offices of the company are at Petoskey. Mr. Whyland is general manager of the flourishing and rapidly growing corporation, which has branches and sub-managers at several points in Michigan.

PEAVEY ELEVATOR FIRE.

On Saturday evening, February 17th, the large wooden terminal system of the Peavey Elevator Company at Duluth was destroyed by fire. The building contained 600,000 bushels of wheat, 174,000 bushels of oats, 100,000 bushels of flax, 64,000 bushels of rye, valued at $690,000 and insured for $661,000. The building was valued at $300,000 and insured for $275,000, or a total value of $990,000. Total insurance, $940,000. A battery of 30 concrete grain elevator tanks containing over 2,500,000 bushels of mixed grain, the nearest line of tanks being 35 feet away from the wooden buildings destroyed, passed through the conflagration without showing the slightest injury either to the concrete tanks or to the grain stored therein; notwithstanding the intense heat from the millions of feet of dry lumber in the wooden structure and the 938,000 bushels of grain consumed, was sufficient to fuse the structural steel connecting the two buildings. The heat was so great that men could not approach the fire within several hundred feet. Yet the eight to twelve inches of concrete forming the walls of the nearest line of tanks gave ample protection to the grain stored therein. There was no attempt made to check the fire as it had already passed beyond the capacity of any fire department to subdue a few minutes after it had been discovered.

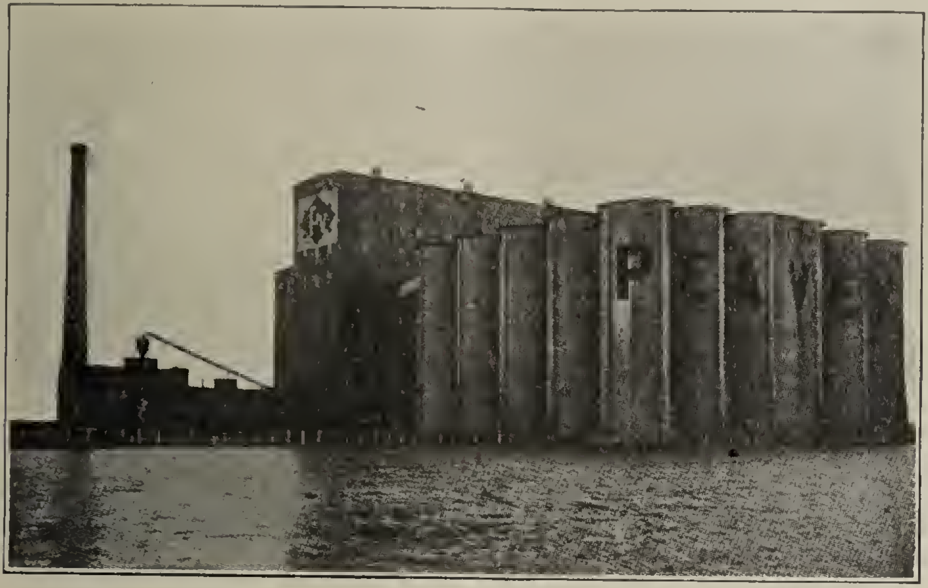


Fig. 1. Peavey Wooden House in Back- ground.

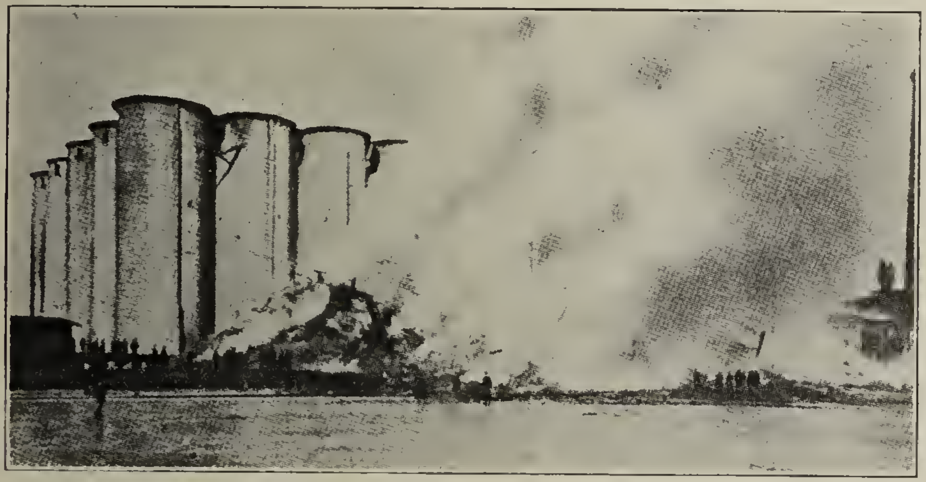


Fig. 2. Wooden House Destroyed. Concrete Bins Uninjured.

Fig. 3. After the Fire.

LEGISLATION CONCERNING THE USE OF CEMENT IN NEW YORK CITY.

By R. P. Miller, Chief Eng., Bureau of Buildings, New York City.

The prime function of a building law is the protection of the general public against the dangers resulting from: First, bad construction; second, hazardous surroundings; third, defective equipment; fourth, inadequate means of escape; fifth, unsanitary conditions. The enforcement of such law is included in the police powers of the state or municipal government.

The third, fourth, and fifth of the dangers above specified may be entirely dismissed from consideration in this paper. They relate to the supplying of proper fire fighting appliances in structures, and the affording of good and sufficient means of escape from fire or panic to the occupants of buildings and securing healthful surroundings for them. They apply equally to all kinds of construction, irrespective of the materials used. The other two dangers, bad construction and hazardous surroundings, do very materially concern the question under discussion.

The dangers of bad construction would include those due to bad materials, bad workmanship, including incompetent supervision, and bad design. (This is not the logical order, but this order is taken for convenience in this discussion.)

The dangers of harzardous surroundings are those attending the inability of a building to withstand attacks from outside sources, such as excavations on adjoining premises, but more particularly fire in adjacent structures. When we have provided against these in our laws, we have secured the essential requirements that constitute a satisfactory law.

It is the object of this paper to consider what these requirements are, so far as they apply to the use of cement, and especially from the standpoint of one who has been called upon to administer the law for a period antedating the present phenomenal growth in the cement industries.

Cement is used in different ways in building construction, most extensively in mortar, very largely in concrete, both plain and reinforced; in increasing quantities in building blocks, also for cement blocks, artificial stone, stucco, and in perhaps other less important ways.

In whatever way cement may be used in construction, its quality should be up to a certain standard, and it is properly within the province of the law making power to fix that standard, or at least to recognize some standard otherwise established and recognized. This may be done either by giving a complete specification in the law or authorizing the executive officer of the building bureau or department to prescribe, within proper restrictions, the requirement which all cements must meet. The former way is the less desirable, not only in the particular matter under discussion, but in all building law, as it retards progress and makes no provision for new materials and processes or improvements. Building laws should be sufficiently flexible to be capable of meeting new conditions. This can be best accomplished by laying down in the law only fundamental principles and investing the executive officer with power to fix the more definite requirements. That this power may not be abused, it should be restricted to such an extent as to require the publishing of all proposed requirements and the holding of public hearings, if demanded, before the same become effective.

In the case of cement, the fundamental principles should be such as to secure strength and soundness. As to the more specific requirements, nothing better could be done than to adopt a standard specification promulgated by some organization of recognized national reputation, such, for instance, as that of the American Society for Testing Materials. No specification ever drawn satisfied everybody, but one presented by such, though it does not in some particulars meet the views and criticisms of the building official immediately concerned.

As to strength of cements, the present building code requires the tensile strength of neat briquettes to be:

For natural cements:

After twenty-four hours set in air, sixty pounds per square inch.

After one day in air and six days in water, 120 pounds per square inch.

For Portland cements:

After twenty-four hours set in air, 120 pounds per square inch.

After one day in air and six days in water, 300 pounds per square inch.

In the case of the natural cements the requirements are still considered satisfactory, but for Portland cements the accepted present standard is higher—namely:

After twenty-four hours in air, 200 pounds per square inch.

After one day in air and six days in water, 500 pounds per square inch.

This is fully 66 2-3 per cent better than the old standard.

This illustrates, in a measure, what has been said about the flexibility of law. As conditions improve, it should be possible for the building official to demand the use of up to date material.

Neither the New York building code nor any other building law that has come to our attention makes any provision for soundness, and yet this would seem to be the more important characteristic of a cement. A contractor or speculative builder would possibly not care whether his structure lasted beyond the final payment or the transfer of the property, but the interests of the public demand that it shall. In some cases self interest would also require lasting qualities. The manufacturer of concrete building blocks or cement brick could not afford to have his product disintegrate in six months or a year after it has been put into a building; and yet that would happen if his cement should be unsound.

So long as cements were used in construction where the individual masses were large and unbroken, the importance of soundness in cement was not so apparent, but since the introduction of building blocks, and especially of reinforced concrete construction, this matter becomes of first importance. Imagine the consequence of the disintegration of a concrete column, due to unsound cement, in the basement of a heavily loaded five story warehouse.

Municipal inspection bureau could not of course inspect all cements used in the building operations, nor is it the function of the government to do so. The law should require, however, as it does in New York, that all brands of cements be tested under the supervision of the proper official, at such times and as often as may be deemed necessary; that a record of all cements answering the lawful requirements be kept for public information; and that no other cement be used.

The law should further prescribe that all cement used in important work, especially in work where the masses in the individual members composing the structure are comparatively small (compared to the entire mass), such as reinforced column and floor work or building block manufacture, should be tested for strength and soundness by the contractor or manufacturer at some reputable laboratory, and a certified copy of such tests filed with the proper building official.

Mortar and concrete, it may be said, are the forms in which cement for building purposes is always used. It is therefore quite within the province of the law to prescribe the characteristics of the other component materials. These may be one or several of a number of materials—sand, gravel, broken stone of many varieties, slag, cinders, broken brick, etc. The extent to which any of these materials is used will depend largely on local conditions. The proper proportions in which they are used vary with the material and the size used. To get the best results the mixture must be well balanced, and other characteristics for materials of this nature and the conditions under which tests shall be made and approvals issued. The requirements conditioning the acceptance of the materials were based on the results of an elaborate series of tests on common brick as delivered in the New York market, and on the theory that any new material should be at least as good as that most commonly used. These regulations containing the requirements were published in the technical journals, and it was hoped at that time that they would bring forth such discussion and criticism as would be useful in determining whether the requirements were fair or perhaps too severe. Thus far no objections based on reliable data have been made, and this is probably due to the total lack of definite information.

Section 14 of the New York regulation is as follows:

"14. The following requirements must be met to secure acceptance of the materials: The modulus of rupture must average 450 and must not fall below 350 in any case. The ultimate compressive strength must average 3,000 pounds per square inch and must not fall below 2,500 in any case. The percentage of absorption (being the weight of water absorbed divided by the weight of the dry sample) must not average higher than 15 per cent and must not exceed 20 per cent in any case. The reduction of compressive strength must not be more than 33 1-3 per cent, except that when the lower figure is still above 3,000 pounds per square inch the loss in strength may be neglected."

The Philadelphia building bureau adopted these regulation in toto at the time, but has recently modified them so far as they relate to concrete building blocks. Their requirements are as follows:

"14. The following requirements must be met to secure the acceptance of the materials: The modulus of rupture for concrete blocks at twenty-eight days old must average 150 and must not fall below 100 in any case. The ultimate compressive strength at twenty-eight days must average 1,000 pounds per square inch and must not fall below 700 pounds in any case. The percentage of absorption (being the weight of water absorbed divided by the weight of the dry sample) must not average higher than 15 per cent and must not exceed 20 per cent in any case. The reduction of compressive strength must not be more than 33 1-3 per cent, except that when the lower figure is still above 1,000 pounds per square inch the loss in strength may be neglected."

We are not prepared to defend these requirements against all criticism; in fact, any information of tests that would establish the correctness or the unfairness of these requirements would be most welcome. This much, however, must be said, that thus far several new materials have met the New York requirements, and among them cement brick. No concrete building blocks have yet been tested in accordance with these requirements. While it would seem that some change is desirable for the benefit of the building block, it is believed that the Philadelphia requirements are too low. It may be true that by virtue of the larger size of the units a wall built of building blocks has some advantages of strength over one built of smaller units, such as common brick, still so great a drop in ultimate compressive strength below that required for brick or stone concrete as is permitted by the Philadelphia regulations seems unreasonable. No one contends that an ultimate compressive strength of 2,000 pounds at twenty-eight days for concrete or 2,500 pounds for brick is too high, yet it is proposed to accept building blocks with an ultimate compressive strength of 1,000 pounds at twenty-eight days, and even then make no provision for extra thickness in a wall built of building blocks above that required for brick or Portland cement concrete.

In the case of reinforced concrete, however, the question of the mixture must be disposed of in a different manner. Reinforced concrete construction is put up in place. The component parts, concrete and steel, are differently disposed for varying conditions of shape, span, and loading. The entire construction must be carefully planned beforehand, every part must be denitely fixed, and the size and position of each element must be determined by calculation. In order, therefore, that any governmental control in such case may be had, a denite mixture must be used, the physical characteristics of which—crushing strength, modulus of elasticity, adhesive power, resistance to shear—are well known; and the law making power is fully justified in prescribing such mixture for all work of that kind under its jurisdiction. What that mixture should be will again depend somewhat on local conditions, or it would be out of all reason to prescribe a trap rock mixture in a locality where trap rock is commercially unobtainable.

The New York regulations permit a variation in the mixture from the prescribed proportions of 1-2-4, so long a sit can be demonstrated by tests, under the supervision of the bureau, that the compressive strength at twenty-eight days does not fall below 2,000 pounds per square inch. Experience has shown that very little latitude should be allowed in this matter of variation of mixture, as it is practically impossible to properly control the construction where more than one mixture is used. If the designers could be held criminally responsible for their results, no limitations of this kind would be needed, but so long as the building authorities are held to a partial accountability they are fully justified in insisting on a single well known mixture for reinforced concrete construction.

Before dismissing this question of materials and mixtures, one other commonly used mixture should be considered—namely: cinder concrete. The excellent fire resisting quality of this concrete makes it a most useful building material. Its great lack of uniformity and its consequent unreliability in strength make it necessary to deprive it from consideration as a construction whose strength is calculable. The practice in New York is to insist on load tests on full sized constructions for every variation in span and detail of construction in order to determine allowable working loads.

Floor constructions are here alluded to, as that is practically the only form requiring strength in which it is used. The factor of safety demanded is ten; that is, the section of floor to be tested is loaded till it breaks, and one-tenth of the uniformly distributed breaking load is taken as the working load.

Good workmanship is important in all construction, but in no form of construction is it so important as in reinforced concrete; and in that form of construction it is no more nor no less important than good materials or good design. So far as law is concerned, however, workmanship may be dismissed in a few words. The law can simply demand that all possible care be exercised in securing it. It will always be secured if there is competent supervision. Competency is secured by study and experience. It is not necessary to go into such details as cautioning against freezing mortar, using cements that have begun to set, where there is competent supervision. There would be no end to these detailed requirements if once begun. How to secure competent supervision in all cases, especially where builders and owners are unwilling to pay for it (though it is an excellent investment) is a difficult problem. The following suggestions may, however, be a step toward the solution. Let it be made compulsory that every building operation shall be in charge of a licensed inspector or superintendent, who shall have received his license from a competent examining board, and who shall be criminally responsible for the work and for infraction of the law. The details of this plan have no proper place in this paper, for they are of general application and not peculiar to this form of construction.

For a design of a structure, the designer must always be reasonable. The supervision of the design by the building authorities should only be to assure that the allowable working stresses have not been exceeded, that the prescribed floor capacities are provided, that proper light and ventilation are secured, etc.; in fact, that the general provisions of the law are complied with.

To go beyond this is to relieve the designer of that much responsibility and to place it where it does not belong. Building departments or bureaus should be bureaus of record, and their records should be complete. The Prussian regulations on reinforced concrete go so far as to even demand that a copy of all calculations as to strength be filed, although they may not be checked over.

There is a great tendency to particularize in our laws and to add provision upon provision, to make more and more a complete specification of the law. Instead of this, as has already been stated, only fundamental principles should be included in the law. The designer should be allowed all possible freedom, but at the same time he must be made absolutely responsible for his work.

So long as these conditions do not obtain, it is perhaps better that the law should go further than necessary in prescribing limitations. Under such circumstances it is to the interests of the good and honest designer and builder and users of cement that the law should err on the safe side and take a conservative position.

New York City was the first municipality in this country to prescribe regulations on the use of reinforced concrete. They were drawn after much study and considerable discussion among experts at a time when the construction was not widely known. That they have been fair and good is attested by the fact that with not many changes the requirements on that form of construction, laid down in the model building code recently proposed by the National Board of Fire Underwriters, are those of New York City; and these latter requirements were, as stated by one closely connected with their promulgation, the result of study, of suggestions and criticism of many engineers and experts. Besides these two codes there are ordinances in Chicago, Cleveland, and Denver.

Taking up in more detail the fundamental principles to be laid down for the guidance of the designers, these should include:

1. The allowable stresses in the materials.
2. The methods used in calculating the stresses produced.
3. The guiding principles in determining the resistance to these stresses.

It is generally conceded that the tensile strength of concrete should not be considered.

The New York, Chicago, and Cleveland laws prescribe working stresses, but the proposed code of the National Board of Fire Underwriters prescribes a factor of safety applied to working loads and the use of ultimate stresses. It is not proposed to discuss here the superiority of either method over the other, as both will give safe results if intelligently used.

The following stresses should be used and are those prescribed by the laws cited, the ultimate stresses being those used by the National Board of Fire Underwriters:

	Working stress. Lbs. per sq. in.	Ultimate. Lbs.
For extreme fibre stress of concrete in compres	500	2,000
For shearing stress in concrete	50	200
For concrete in direct compression	350	
For tensile stress in steel	16,000	Elastic limit.
For shearing stress in steel	10,000	
For adhesion of concrete to steel	50	200

The Denver ordinance gives no stress values, but refers to a hand book, a practice that is not to be commended. The Chicago ordinance permits a shearing stress in concrete an adhesive value of seventy-five pounds per square inch, which, in the opinion of the writer, is too high. On the tensile value of steel there is also a difference, only New York and Cleveland fixing a definite figure, 16,000 pounds, and Chicago permitting one-third of elastic limit. On this point there is much opportunity for discussion. The writer believes a definite value should be adhered to, and that should be 16,000 pounds working stress.

It is generally believed that the adhesion of concrete to steel may be taken the same as the shear in concrete. The Denver law, however, prohibits the use of plain bars. This is an unjust limitation on the designer, so long as the safe limit of adhesion is not exceeded. When this occurs, all the laws are agreed that other provisions should be made. So, too, would it be an unfair requirement to prescribe the use of stirrups unless the safe resistance to shear is exceeded, or to insist on the use of certain bars to secure rigid attachment of stirrups. This is no more important than the placing of the tension bars in their exact position, which must be taken care of in the supervision of the construction.

The Cleveland law makes provision for compression in steel. This is unnecessary, as the allowable compression in the steel must depend on the assumption of the ratio of modulus of elasticity of the two materials, unless the steel is designed to take all the load, in which case we are no longer dealing with reinforced concrete.

The maximum ratio of length to diameter of columns is fixed at twelve in all but the Denver law, where hooping is required when the ratio exceeds four.

To the calculation of bending moments and the determination of moments of resistance, the practice is quite uniform and the New York provisions are suggested as sufficiently full:

"13. The following assumption shall guide the determination of the bending moments due to the external forces. Beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates when constructed continuous and when provided with reinforcements at the top of plate over the supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than $\frac{WL}{10}$; the bending moment may be taken at $\frac{WBO}{20}$ in the case of square floor plates, which are reinforced in both directions and supported on all sides. The floor plate to the extent of not more than ten times the width of any beam or girder may be taken as part of that beam or girder in computing its moment of resistance.

"14. The moment of resistance of any concrete-steel construction under transverse loads shall be determined by formula based on the following assumptions:

"(A) The bond between the concrete and steel is sufficient to make the two materials act together as a momogeneous solid.

"(B) The strain in any fibre is directly proportionate to the distance of that fibre from the neutral axis.

"(C) The modulus of elasticity of the concrete remains constant within the limits of the working stresses fixed in these regulations."

From these assumptions it follows that the stress in any fibre is directly proportionate to the distance of that fibre from the neutral axis.

The tensile strength of the concrete shall not be considered.

It is believed that these provisions go as far as necessary (they are somewhat elaborate in the National Board of Fire Underwriters' code) and do not unnecessarily hamper the designer. For a comparatively new form of construction, in which uniform practice is not yet thoroughly established, it cannot be said that they go too far.

Regarding the use of concrete building blocks in the design of new buildings, an important question arises as to the height to which they shall be allowed in walls. Chicago restricts their use to dwellings and stables not more than two stories in height. Cleveland allows them for buildings of ordinary (non-fireproof) construction four stories in height. Philadelphia permits them for six story buildings. Their use is not yet allowed in New York (Manhattan).

Concrete is generally assumed and frequently accepted as fireproof. The later laws on concrete recognize it as fireproof and prescribe minimum thickness to be used for covering the embedded metal. That concrete is incombustible cannot be denied, that it will not disintegrate under fire cannot be maintained (stone and gravel concrete only is being considered now). The New York building authorities have made fourteen fire tests on concrete constructions, of which seven proved successful. It would seem that in the cases of failure the concrete when tested was too green—that is to say, it contained too large a percentage of uncombined water which was converted into steam and caused the disruption of the concrete. This makes it necessary to guard against the occupancy of concrete structures within the time required for the concrete to appropriate all its water. That a reinforced concrete building is far superior as a fire resisting structure to a mill structive building must be conceded; that it is equal to the best type of fireproof construction cannot justly be claimed.

The best practice in this particular is that given in the code of the National Board of Fire Underwriters, as follows:

"Reinforced concrete construction may be accepted for fireproof buildings if designed as hereinafter prescribed, provided that the aggregate for such concrete shall be hard burned, broken bricks or terra cotta, clean furnace clinkers, entirely free of combustible matter, clean broken stone, or furnace slag, or clean gravel, together with clean siliceous sand, if sand is required to produce a close and dense mixture; and provided further that the minimum thickness of concrete surrounding and reinforcing members one-quarter inch or less in diameter shall be one inch, and for members heavier than one-quarter inch the minimum thickness of protecting concrete shall be four diameters, taking that diameter in the event of bars of other than circular cross-section which lies in the direction in which the thickness of the concrete is measured; but no protecting concrete need be more than four inches thick for bars of any size; and provided further that all columns and girders of reinforced concrete shall have at least one inch of material on all exposed surface over and above that required for structural purposes; and all beams and floor slabs shall have at least three-quarters inch of such surplus materials for fire resisting purposes; but this shall not be construed as increasing the total thickness of protecting concrete as herein specified."

Of the fireproof quality of cinder concrete there can be no question, as already intimated. The thirty-six tests made under the supervision of the New York building bureau would remove any doubt in the matter.

On the fireproof character of building block walls very little is known. Information is much desired.

The weathering qualities of concrete, more especially in the shape of building blocks, should be fully and carefully investigated. Some freezing tests made for the New York building bureau on cement blocks indicated a tendency of the material to distend and a loss in compressive strength of about 40 per cent resulted. On concrete building blocks the absorption is probably high (this is not based on actual observation) and a deterioration of the material in freezing seems likely. To guard against danger in this respect the following New York provision is desirable:

"That the freezing and thawing process must not cause a loss in weight greater than 10 per cent nor a loss in strength of more than 33 1-3 per cent, except that when the lower figure is still above 3,000 pounds per square inch the loss in strength may be neglected."

To this may be added that if the lower figure is still above 2,000 pounds per square inch, the loss may be as much as 50 per cent, but no more.

In conclusion it may be said that of all the suggestions made in this paper the most important is the one fixing the responsibility for bad design and bad workmanship. It is decidedly in the interest of every cement user that so valuable a structural material as cement should be applied honestly and intelligently, leaving no chance for its condemnation because of improper or irresponsible work.

REINFORCED CONCRETE BRIDGE FLOOR.

The engineering department of the state of New York has prepared plans for reinforced concrete bridge floors. We illustrate a cross-section for a country highway bridge with spans between 25 and 100 feet.

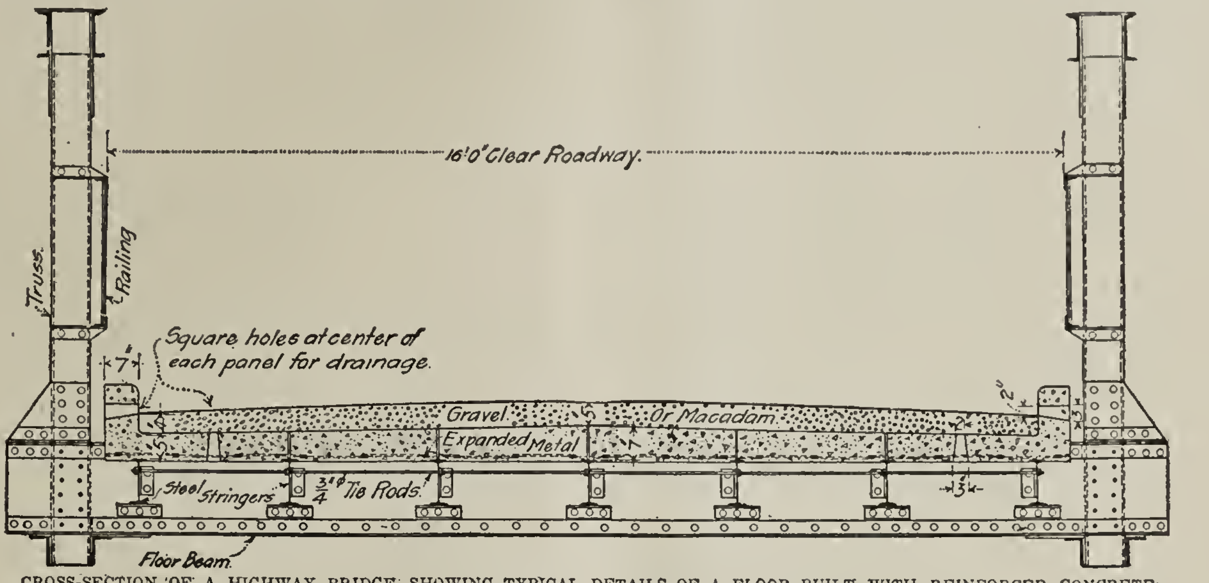
While concrete floors cost more than plank floors in the first instance, the saving in maintenance, however, more than justify the additional expense. The danger due to accident caused by decay or broken plank being avoided.

By using for the top hard stone, such as granite or trap, crushed fine, a surface can, with proper care, be obtained which will successfully withstand the wear of traffic without the addition of any top coat of gravel. It is, however, difficult to obtain a satisfactory surface with the labor usually at hand, and it is, therefore, generally advisable to cover the concrete with from four to six inches of gravel or crushed stone. If no gravel is used, the concrete should be brought to an even surface finished slightly rough; if hard enough to be durable and too smooth, it will be extremely slippery.

The cut shows the concrete floor to consist of reinforced concrete slabs resting upon steel stringers, for spans up to 25 feet. By the use of suitable centering, however, the concrete can be made in place in monolithic slabs extending the full width of the bridge. Another successful method is to build concrete arches between the stringers, in which case the tie rods should be placed at the bottom of the stringers to withstand the arch thrust. Other satisfactory arrangements are also often used, the exact details being determined by the judgment of the engineer employed, or upon the peculiar facilities of the bridge company for doing the work according to its own method.

The strength and durability of such constructions depend upon the proper proportioning of all the parts.

A clear width of sixteen feet between steel work is generally recommended except for spans above one hundred and fifty feet, for which the clear width should preferably be eighteen feet, and except for villages and towns where the width must be determined by local considerations. The work should be carried on under the supervision of competent engineers.



CROSS-SECTION OF A HIGHWAY BRIDGE, SHOWING TYPICAL DETAILS OF A FLOOR BUILT WITH REINFORCED CONCRETE SLABS.—PREPARED BY STATE ENGINEER OF NEW YORK.

The Lehigh Portland Cement Co. will erect fifty cottages for its employes at Mitchell, Ind.

The Iowa Enamel Stone Co., Davenport, Iowa, incorporated to manufacture polished cement stone, brick and tile. Capital, $40,000.

The National Portland Cement Co., represented by J. R. Hanahan of Charleston, S. C., will erect a Portland cement plant at or near Birmingham, Ala. F. H. Lewis of Stanton, Va., has been selected as chief engineer.

The Wisconsin Portland Cement Co. expects to erect a 1,000-barrel plant at Lake Ennis, Wis., 12 miles from Portage, Columbia county, in the near future. F. H. Merrill of Portage is secretary of the company.

The Western Portland Cement Co. of Yankton, S. D., will furnish 20,000 barrels of cement for the United States government dam at Belle Fouche, Butte county, S. D.

The Lehigh Portland Cement Company has started crushing stones and making concrete at its new plant at Fogelsville, Pa. The railroad is nearly graded and the building is going forward. A pipe line of 2,600 feet has been laid from a spring in Mohr's Valley to the crusher to supply the water.

David Murphy, president of the California Portland Cement Co., announced at a dinner tendered to the officers and directors of his company by the mayor and citizens of Colton, Cal., that his company had set aside $200,000 to improve and enlarge the company's works at once.

The Standard Cement Co. of Charleston, Clarke county, Ind., has sold its plant and holdings to a Chicago syndicate, represented by George Williams, of the George Williams Plaster Co. The syndicate propose to convert the plant into a Portland mill. An exhaustive examination of the raw materials on the purchased lands show that Portland cement can be manufactured from the same. The purchase price is said to have been $30,000. The Standard Cement Co. plant has been closed for several years. The J. B. Speeds Portland cement plant, in the same county, is about ready for business.

A MODEL REINFORCED CONCRETE THEATER FOR STUDYING THEATER FIRES.

BY E. PROBST, C. E., ZURICH, SWITZERLAND.

The comparative frequent occurrence of disastrous theater fires during the past few years, especially at Vienna, Paris and Chicago, has awakened a lively interest in the subject by experts who have been giving the matter careful consideration with more or less practical results. Just after the great disastrous Ring Theater fire at Vienna, a small model theater one-tenth ordinary size was constructed at Linz, Austria, for experimental investigation of the best means to overcome, or at least to lessen, the disastrous consequences of such conflagrations. It was found that no practical results could be obtained from the Linz model theater, on account of its small dimensions and insufficient scenery. Soon after the Iroquois Theater fire, the subject was again taken up on a much larger scale by the Austrian Society of Engineers, architects who resolved to study the subject on practical lines, by constructing a model reinforced concrete theater building of sufficient size and equipment to warrant sufficient reliable data to prevent or at least mitigate the repetition of these theater catastrophies. Architects Hellmer and Fellner of Vienna were commissioned to prepare plans and specifications and superintend the erection of a reinforced concrete model theater, on which studies and experiments were to be made. Messrs Hellmer and Fellmer, having an extensive practice in constructing theater buildings in many of the large European cities, were, therefore, well qualified for the task. Experience shows that a great majority of theater fires originate on the stage. Means must therefore be provided in constructing theater buildings to limit and confine these fires to the stage by installing suitable devices to carry off the fumes and expanded heated air on the stage before an explosion takes place, which usually occurs when the intensity of the flame reaches the highest point. Outlets must therefore be provided, otherwise the curtain being the weakest point, will be thrown into the auditorium by the explosion, filling the auditorium with noxious fumes. This has been the case in the great destructive fires in Vienna, Paris and Chicago. To confine the fire to the stage iron curtains must divide the stage from the auditorium. Even a single iron curtain may not be sufficient to resist the great atmospheric pressure developed by the high temperature, as the curtain may be forced out of its framework. Experiments were therefore made to safeguard the audience independent of the iron curtain, by providing large outlets or openings from the stage for the free and rapid escape of the fumes.

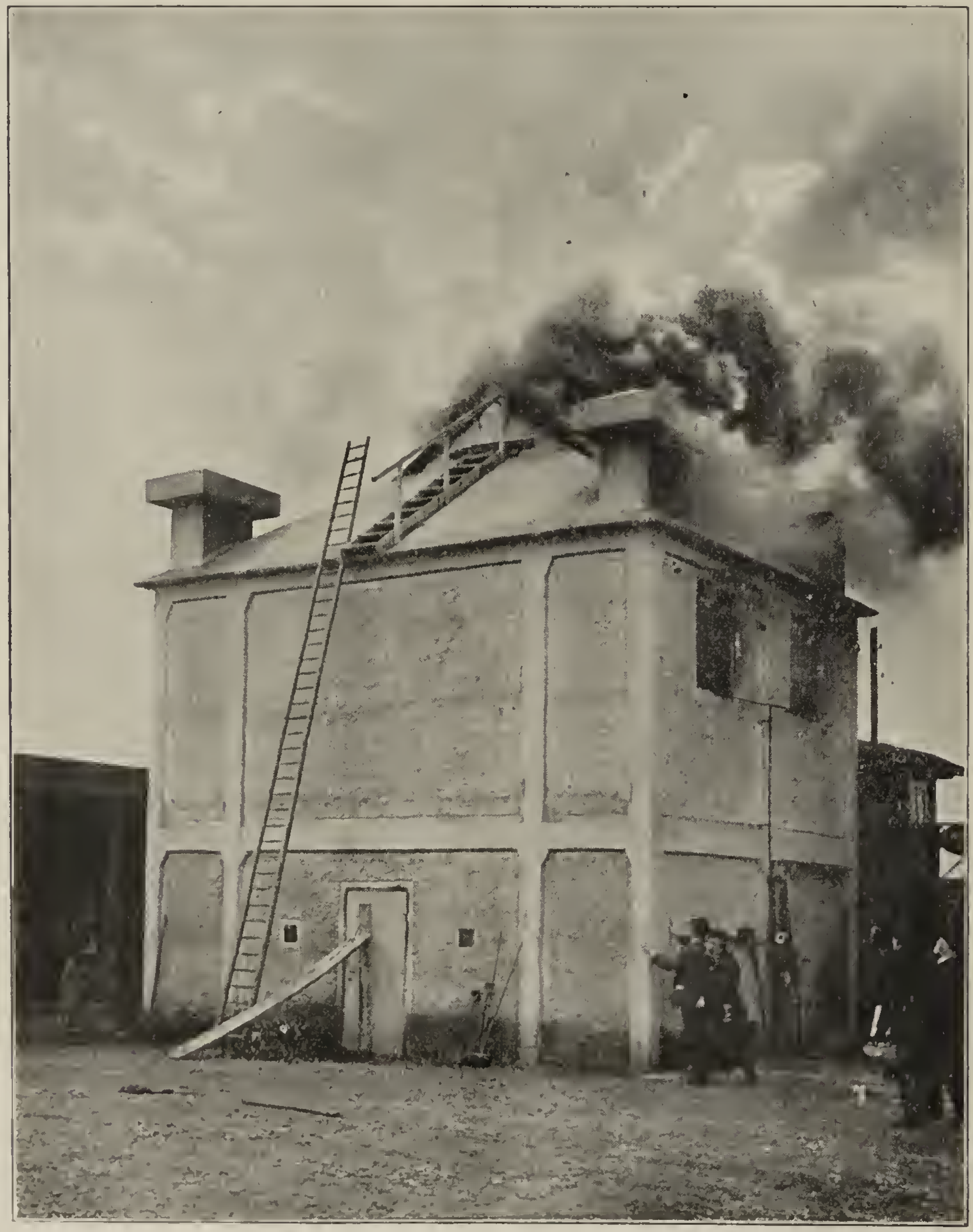


Fig. 1. Ventilators Closed, Curtain Up.

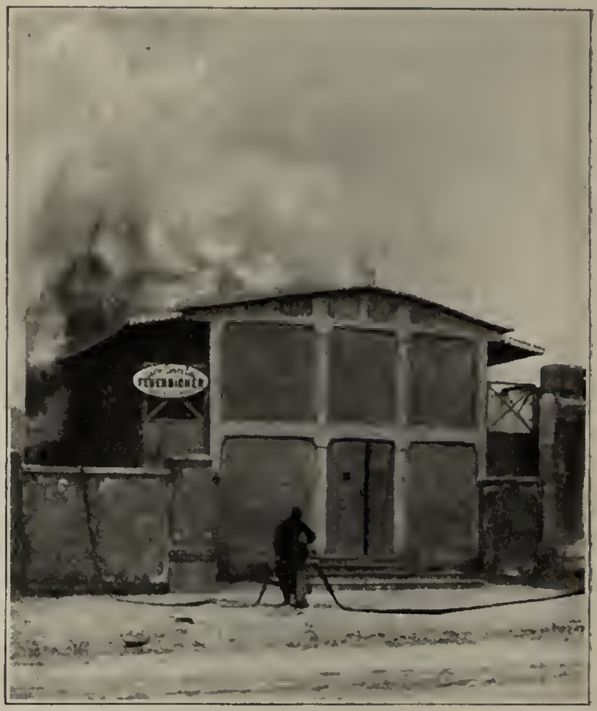


Fig. 2. Ventilators Closed, Curtain Up.

Another reform considered was the installation of emergency lighting. Petroleum and other oil lamps must be placed in direct communication with air outlets from the building for the escaping of the fumes, under the regulations prescribed by municipal authorities.

The model theater building construction of reinforced concrete contains all of the improvements suggested. It was built on the Monier system. The exterior walls being only 2⅜ inches thick. The columns were of two sizes, the smaller being 5¾ inches square, the larger 9⅞ inches square. The beams carrying ceilings 5¾x9⅞ inches and 7½x11⅝ inches carrying slabs 2⅜ inches thick.

The stage is 24 feet 6 inches wide, 19 feet 6 inches deep, 27 feet 3 inches high. The stage floor is 13 feet 8 inches wide by 8 feet 6 inches high, with a safety exit direct to the open air. The auditorium 18 feet 7 inches wide and 23 feet deep by 15 feet 4 inches high. It likewise contains a gallery with an iron rail and two outside staircases. The rear end of the pit or "parterre" has a Monier wall with a door and large glass window, so that the incidents of the fire tests on the stage can be observed with safety. Leading from the stage there are three iron doors each of different construction. One has double iron plates, No. 19, American w. g. One wooden door covered with sheet iron, No. 19, American w. g., with asbestos between the iron and wood. The third made of iron plates fitted with corrugated iron, No. 19, American w. g.

On each side of the stage there is a working gallery on the Monier system 9 feet 3 inches, and a wooden platform 19 feet by 6 inches high, 1 3-16 inches thick, protected by fireproof paint. Four hinged swing windows, 8 feet 6 inches wide by 4 feet 5 inches high, admit light to the stage. In the center of the roof over the stage are shutters 7 feet 4 inches long by 3 feet 3 inches wide, made to open in halves, and to slide in iron grooves on either side, providing an opening equal to 5 per cent of the stage area.

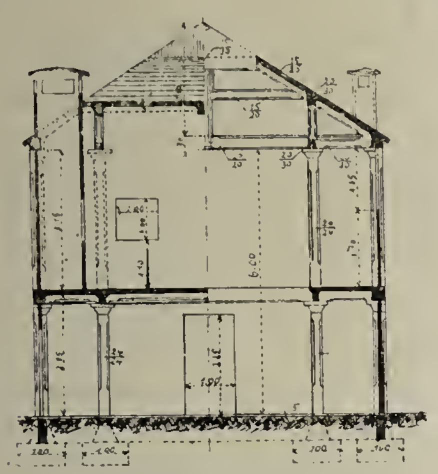


Fig. 6. Cross-section Through Stage.

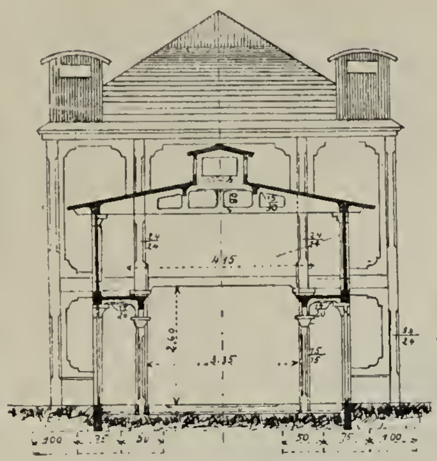


Fig. 7. Cross-section Through Auditorium.

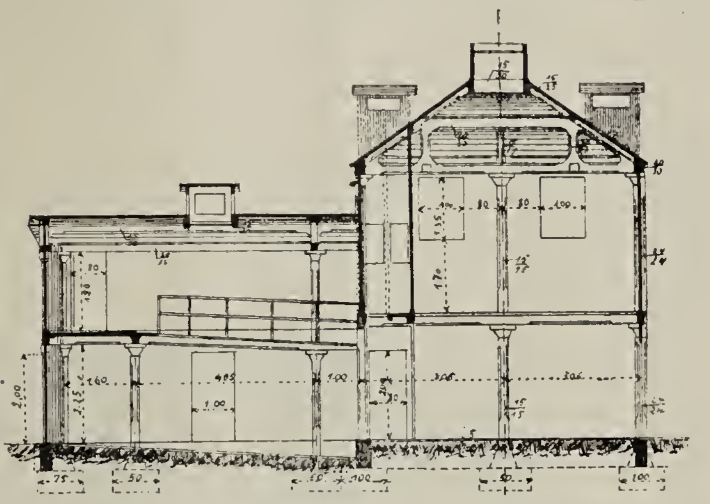


Fig. 8. Longitudinal Cross-section Through Auditorium and Stage.

In the angles back of the stage there are two large chimney flues with 8 square feet openings; two chimneys in the front angle of the roof, having slightly larger openings. A central exhaust flue over the auditorium 3 1-5 feet square opening with two flaps and a cowl which moves with the wind. All the valves in the various flues can be opened by levers on the outside of the stage. The stage is fitted with an iron curtain which slides in iron grooves. The curtain is formed of curved metal interlocking sections, covered with asbestos felt 1-6 inch thick on auditorium side, over which is placed sheet metal facing. An iron door is placed in the center of the curtain.

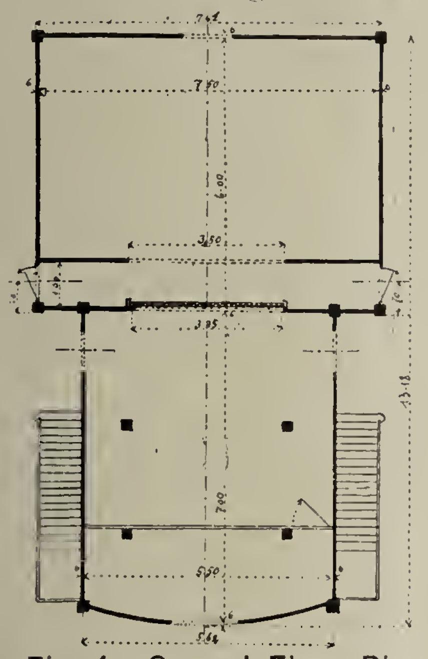


Fig. 4. Ground Floor Plan of Stage and Auditorium.

Above the stage is fitted a complete system of automatic sprinklers which come into operation by a temperature of 158 F. Openings are arranged for air supply in case of fire.

In order to be able to observe the experiments, there are in the auditorium and on the stage several plat-glass windows made of "Electrolyt" glass. Both gas-jets, candles and oil lamps were placed in the auditorium and on the stage. The electrical emergency lighting consisted of five electrical incandescent lights distributed both in the auditorium and on the stage, each one being independent of the others, as in the case of lamps or candles.

In order to ascertain the pressure, the temperature and the composition of the air, there were placed a "manometer" with 36-inch water column, a "pyrometer" of 1,472 degrees, two thermometers of 572 F., and an analyzer for determining the carbonic acid, oxygen and coal gas. In order to measure the curvature in the curtain caused by the pressure, a special apparatus was installed for the purpose.

In executing these tests 27 experimental fires were made in 8 days. Some with precautions for safety; some with and some without the automatic sprinklers.

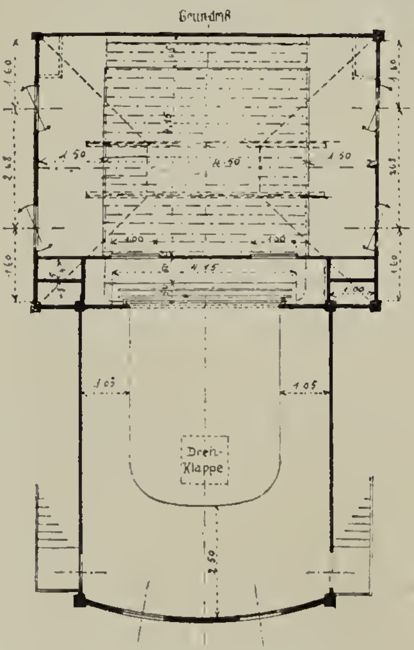


Fig. 5. Plan of Gallery and Stage.

In order to exactly reproduce a stage fire there were placed in position old sceneries, and paper rolls same width as the stage were hung on poles and soaked with petroleum.

The quantity of materials, chosen in proportion to the size of the place, correspond to the amount of decoration used at two performances.

The first experiment (see the two illustrations, 1 and 2), was held under most unfavorable conditions, with closed ventilators, the curtain open, the draught directed to the auditorium being caused by the open doorway, and the falling of the stage curtain. The spectators were behind the Monier wall furnished with windows at the rear of the auditorium.

Soon after the fire was started, a violent rumbling sound was heard, like wind rushing through the air, and large volumes of flame burst into the auditorium; the thick fumes extinguished the candle and gas lights; the petroleum lamps and the electric lights only continued burning.

Much better results ensued by the fire test with open ventilators. People could remain in the auditorium, though the curtain had not been lowered.

The best results were shown at the experiment where the iron curtain had been let down, and all the stage ventilators opened at the proper time. The fire raged in the stage without affecting the auditorium. The highest temperature at these experiments was 720 F.; on the stage, the highest pressure was equal to a column of water 6 4-10 inches, and in the auditorium, 5 6-10 inches.

The results of these experiments can be summed up in the following manner:

1. The iron curtain stood the test fairly well.
2. The smoke flues over the stage are the most effectual safeguards.
3. Of the lighting, the gas flames were the first extinguished on account of the pressure; the candles and lamps continued burning and were only extinguished by draught or fumes. The most satisfactory were the electric incandescent lights.

In conclusion we may mention that the reinforced concrete building stood all the fires perfectly.

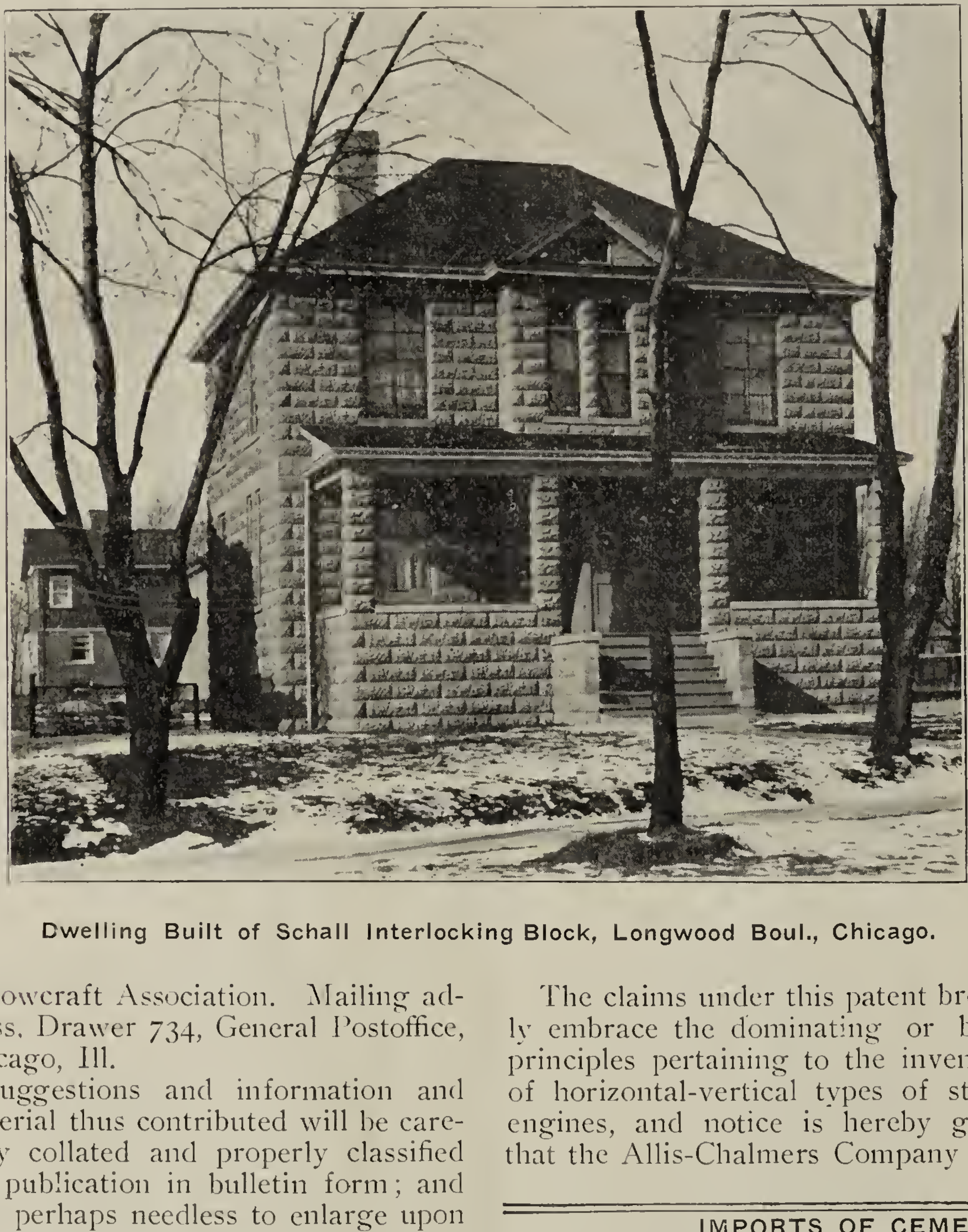
These experiments have been both interesting and instructive and point out to designers of theaters precautions to be taken in minimizing the danger attending theater fires. While the prevention of such fires will depend upon the vigilance of the municipal authority and the alertness of its inspectors and firemen.

ART IN CONCRETE.

An appeal for co-operation between the practical and artistic branches of the cement industry, recommended and adopted at the Milwaukee Convention by Section "Art and Architecture" of the National Association of Cement Users.

It is earnestly requested that suggestions that may occur to anyone regarding artistic and useful forms of concrete construction, or photographic reproductions, or pencil sketches, that can be made or procured of such forms already in existence, be transmitted to Honore J. Jaxon, Secretary Fellowcraft Association. Mailing address, Drawer 734, General Postoffice, Chicago, Ill.

Suggestions and information and material thus contributed will be carefully collated and properly classified for publication in bulletin form; and it is perhaps needless to enlarge upon the importance of the work thus proposed, or upon the urgent necessity that each and every one connected with or interested in any branch of the cement and concrete industry shall in a wide-awake spirit do his or her share. It is conceded that the practical merits and artistic possibilities of this most plastic of building materials give just warrant for our expecting the advent of a new and distinctive architecture which shall take its rise from the actual life of the people, and shall lend itself directly to the satisfying, in a rational manner, of present day needs and aspirations; and it is certain, and indeed obvious, that to the speedy realization of this much to be desired result of the practical co-operation herewith suggested will be of incalculable value.



Dwelling Built of Schall Interlocking Block, Longwood Boul., Chicago.

NOTICE.

Attention is called to United States Patent No. 811,520, issued on January 30, 1906. This patent relates to horizontal-vertical types of steam engines, and was granted, after long deliberation and controversy in the Patent Office, on an application filed in August, 1900, by Mr. Edwin Reynolds, and was assigned by him to Allis-Chalmers Company.

The claims under this patent broadly embrace the dominating or basic principles pertaining to the invention of horizontal-vertical types of steam engines, and notice is hereby given that the Allis-Chalmers Company will fully protect and enforce its rights under this patent, against all infringers, and both the public and manufacturers are hereby warned against purchasing from unlicensed manufacturers, using or manufacturing steam engines, embodying an infringement of these rights.

The Tri-State Portland Cement Co., capital $750,000, has been organized to erect a 1,500-barrel plant at Cumberland Gap, Claiborne county, Tennessee. The limestone rock will be quarried in Virginia and coal brought from Kentucky, all within a circle of less than four miles diameter. The company is a subsidiary to the American Association, a corporation financed by English capital, which owns 85,000 acres of mineral lands in Virginia, Tennessee and Kentucky, in the vicinity of Cumberland Gap. Mr. J. H. Bartlett, an Englishman, and large stockholder of the American Association, will be general manager of the cement plant. The Louisville & Nashville Railway will put in a switch from the gap to the plant, a ledge of limestone rock 300 feet bigh and suitable shale deposit 250 high are found on the L. & N. railway 200 feet above the coal bed. The coal is mined at Middleboro, Ky., just over the state line from Cumberland Gap. The cement plant is one of the numerous enterprises the American Association corporation has projected.

The American Cement Company of New Jersey, which claims $20,031 from the state of New York for lands taken by the state, in Elbridge, Onondaga county, has been awarded $1,506 by the state court of claims, in full satisfaction of its claim.

The Maiden Creek Portland Cement Co. has taken up two mortgages on its plant, one for $600,000 given May 7, 1903, and one March, 1904, for $250,000. The mortgages were given on the plant to insure the issue of the company's bonds for like sums.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	DECEMBER				TWELVE MONTHS ENDING DECEMBER			
	1904		1905		1904		1905	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	134,850	$ 532	61.780	$ 618	6,546,080	$ 22.794	13,591,180	$ 43,256
Belgium..........	3.085,097	10.442	15.938,856	48,675	157,747,214	494,822	134,061,542	419,722
France............	1,845,300	7,686	789 900	2,711	13.964,892	49,202	7,545,660	27,748
Germany..........	50,247.838	181,208	15,068,641	51,132	234.225,214	794,743	182,530,173	607,052
All Other Europe	4,409	8	....	....	3,015,044	10,273	240,659	609
British North Am.	....	....	1,500	18	226.475	1,180	166,610	1,609
Other Countries..	....	....	24,400	261	2,836,512	9,899	494,915	2,051
TOTAL......	55.317,494	$199,876	31.855,077	$103.415	418,561,431	$1,382,913	338,630,739	$1,102,041
Domestic Exports of Cement, bbls.	105,931	$131.822	80.857	$96,945	774,910	$1,104,086	1,026,502	$1,387,906

There were 25,660,653 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Dec. 1904. valued at $80.313, against 5,921,494 lbs. in Dec. 1905, valued at $17,543.

For 12 months ending in Dec. 1904, there were 119.575 tons of asphalten imported in the United States, valued at $510,524, against 86,798 tons imported in 12 months ending Dec. 1905, valued at $382,667.

NEW YORK.

While the demand for Portland cement at present is very seasonable, manufacturers and others report that orders booked indicate brisk business just as soon as the building season opens, which promises to open early, a prospect which pleases builders, material men and others. Again, business this year in all building lines promises to "break the record." Plans already settled and under way show that immense quantities of concrete, cement, reinforced steel, etc., will be used—demonstrating the increasing popularity of concrete block, reinforced steel and monolithic construction. The number of responsible companies incorporated to prosecute concrete construction work, block manufacturing, etc., is quite noticeable, and if those engaged in concrete construction will endeavor to do first-class work only, concrete construction will attain additional popularity.

Mr. H. Logan, with F. L. Smidth & Co., engineers, 39-41 Cortlandt street, when asked for trade news by your representative, said: "We have nothing important to give out just now. We are quite busy in all departments. I sent Cement and Engineering News some items a few days ago. Any time you come in will be pleased to keep you posted."

Calling on Thos. Prosser & Son, 15 Gold street, your correspondent was greeted by a tall gentleman seated at a desk who said to the query, "How's business?" etc., "We are all very busy, but have no trade news of importance to give out just now." It was learned indirectly, however, that this reliable house is estimating on machinery for several new Portland cement mills.

John B. Wight, manager of the New York office of the Alpha Portland Cement Co., St. Paul Building, stated that his office finds the cement business good, but he had little beyond that to say. He did not seem inclined to discuss the use of paper and cloth bags in marketing cement.

"Do not use my name in stating this comes from me," said a gentleman high in cement manufacturing circles, "but on the subject of concrete railroad ties, which you have introduced, I have a few facts to present and a few assertions to make. Several railroads, and the Pennsylvania in particular, through its engineering department, have decried attempts made to invent practical concrete railroad ties. While thus somewhat belittling the practicability of such ties, this same company has built hundreds of concrete bridges of the arch type, concrete bridge abutments and is at the present time, near Lancaster, Pa., experimenting with a 1,000-yard strip of reinforced concrete ties to ascertain if they can be successfully used in the North River tunnels when the company's new New York station improvements are completed. Many other railroads have experimented with railroad ties made of reinforced concrete—in fact, several different methods have been used to ascertain if such ties can be practically used. The Chicago & Alton Railroad, for instance, has for several years used three miles of concrete ties on roadway used by freight trains and the ties have given excellent satisfaction. On trackage where fast trains are operated and heavy locomotive wheels pound the tracks, concrete ties have been found unsatisfactory, because they crumble beneath the pounding. It needs a go-between material to break the force of pounding on the concrete to make concrete ties a success, and I am as sure that we will yet have practicable concrete ties as that I am here. Actual necessity will drive trolley and railroad companies into using substitutes for wood for ties. That timber is growing scarce at a fast rate and that the demand for it has wonderfully increased needs no demonstration whatever. Railroads, above all other consumers, must have a substitute for timber, and they will gladly turn to concrete ties if they find them practicable. It makes me weary to hear railroad or cement men say different when, if they knew the future as I do, from calculation and absolute knowledge that certain conditions will come to pass, they would now be up and doing to aid the era of concrete ties. Concrete ties at the present time have numerous opponents, odd as it may seem. Lumber men, for instance, do not intend to stand idly by and see large fortunes slip from their fingers—paid to concrete men rather than to themselves. Railroad engineers have no incentive to break away from time-honored engineering methods. Railroad contractors, used to timber, have every reason to fight any concrete tie movement. The fact is, few railroad owners, officers, men in power, etc., have given the concrete tie subject downright earnest consideration and almost the moment it has shown its head there have been plenty of people with axes to grind to 'knock' them. Concrete railroad ties are in their infancy. Wait until the subject has received sympathetic study from earnest chemists and constructors and I'll wager you will see not one, but a dozen practical, useful concrete ties—ties which will prove far better and more economical than timber ones. Being a manufacturer of cement I can be charged with having an axe to grind. Years before railroads began to use ties the lumber men were charged with the same thing because they 'boomed' building of railroads. Of course I want to sell cement. I'm doing it—selling all our mills can grind, but I would like to see cement manufacturers less indifferent on the concrete tie matter and more enterprising in aiding in its successful solution. Mark my words: Inside of five years at the farthest, we will have concrete railroad ties in successful use on thousands of miles of roadbed." Chats with a number of cement manufacturers on this interesting subject show that while they would like to welcome the era of concrete railroad ties they feel it is not yet at hand.

Herbert R. Hyatt is in charge of the branch office, just opened in the Singer building here, by the Weber Steel Concrete Chimney Co. of Chicago. He will look after the company's interests in New England, New York and north New Jersey. Chimneys constructed of reinforced concrete have proven so durable and economical, the demand for them in the East is noticeably marked and no doubt the Weber company will have all they can comfortably take care of for years to come. Mr. Hyatt, who was formerly with the Custodis Chimney Co., is getting accustomed to his new field and position and his services are already in good demand.

C. E. Bathrick, local representative of the Municipal Engineering & Contracting Co., 150 Nassau street, was in Chicago when Cement and Engineering News' representative called. The New York office has been busy and a large number of the Chicago improved cube concrete mixers have been sold to contractors and constructors and are giving every satisfaction.

The Lock Joint Pipe Co., 346 Broadway, has successfully introduced its new concrete joint pipe covering for piling and other marine work where torpedoes and other marine borers are apt to attack the wood. It is said there is a good field for just such a concrete product, and it is understood the Lock Joint Co. has in good orders for its product.

The Engineering Company of America, engineers, etc., has removed from 74 Broadway to larger offices at 41 Park Row.

A. H. and H. L. Hadley, of the Hadley Cement Co., recently landed here from a business trip to Europe and Australia. They say their company, this spring, will establish cement mills in Germany, to supply their trade in England and parts of Europe.

The Bangor Railway and Electric Co., of Bangor, Maine, it is announced, will build a new concrete dam across the Penobscot river near Veazie, to succeed an old dam. The dam is built to secure water power. Work will commence soon.

Quite a number of new firms have entered the field of concrete engineering and concrete block manufacturing work, and among them may be mentioned the following: At Newark,

N. J., the Porcelain Faced Brick Co. will construct buildings, etc., of various materials faced with porcelain and it is rumored will handle more or less concrete work. W. P. Meeker, 192 Market street, is interested. The recently organized Enterprise Sand and Stone Co., 147 East State street, Trenton, N. J., will handle concrete material, etc. William C. Foster, 34 Nassau street, is at the head of the New York Concrete Block, Sand, Lime and Brick Co., which will do a manufacturing business. The Crown Cement Work Co., 147 East State street, Trenton, N. J., will manufacture cement, cement stone, etc. It is stated the Dover (N. Y.) Quarries & Chemical Co. will sell crushed stone to concrete block manufacturers as part of their business. The company recently incorporated and is capitalized at $1,000,000. The Ajax Reinforced Concrete Co. will do construction work and has offices at White Plains, N. Y. The Queens County Concrete Stone Co. is a new Richmond Hill, N. Y., concern, which will manufacture concrete products. The Thompson Cement Stone Co. will manufacture concrete blocks at Gowanda, N. Y. The Kohl Hepp Brick Co. of New York has organized to manufacture and deal in cement products. James Hess, 21 Park Row, is interested. The Asphalt Grille Paving Co., 15 Exchange place, Jersey City, will lay concrete paving among other lines of work. The White Plains (N. Y.) Building Blocks Co. will manufacture cement and concrete building products. Gus C. Odell of White Plains, N. Y., is interested. The Worcester Blacking Co., Worcester, Mass., will deal in cements, etc. C. T. Tatman, 311 Main street, of that city is interested. The Cement Post and Pile Co. of Orangeburg, N. Y., will make cement and composite posts, piles, etc. Wm. H. Coe, 32 Broadway, New York City, is interested. Other new firms are the Arcadia Concrete Co. of Newark, N. J.; Monolithic Construction Co., New York City; Henry A. Sturn, 113 W. 96th street, is interested; Amityville (N. Y.) Cement Works will manufacture concrete blocks; Granite Block Manufacturing & Construction Co., 103 E. Front street, Plainfield, N. J. This latter company is capitalized at $125,000 and will do a general concrete business. The Konkreta Mfg. Co., Borough of Queens, will manufacture and deal in cement, etc. The Port Jefferson (N. Y.) Cement Block Co. is a new $10,000 concern. At Plattsburg, N. Y., Matthew E. Shepard is at the head of a new concrete company which will manufacture building blocks. A new New York City artificial stone company is that of the Fornigli Art Stone and Construction Co., of which Alfred Brod, 168 W. 77th street, is interested.

The Concrete Steel Co., a recently organized engineering and contracting firm, will give attention to reinforced concrete construction. It has offices at 100 Broadway and H. L. McGee is secretary and treasurer. The company has opened a Cincinnati branch office.

Present quotations on cements are: Rosendale, in wood, per bbl., 95c; American Portland, per bbl., $1.50@1.60; in bags, $1.20@1.30; German Portland, per bbl., $1.90@2.10.

Consul McCunn of Dunfermline, Scotland, has notified local parties that he desires prices, etc., on American paper bags suitable for conveying cement. Paper bag manufacturers will do well to forward him their catalogues, price lists, etc. The Arkell & Smith Co. of Canajahorie, N. Y., make such bags.

MANHATTAN.

PHILADELPHIA.

Manufacturers of cement report good business and prices are holding firm. While active building is seasonably quiet, it is known that a number of large operations are being made ready by architects, etc., and of these large operations reinforced concrete construction will constitute an important part. Inquiries for all kinds of building material are coming in to dealers, and indications point to an unusually brisk 1906 building season. The threatened coal strike, and disturbances in labor circles, even now cause some uneasiness, and it remains for the future to tell whether or no these factors will keep back good business in building lines.

In local concrete block, cement machinery, tool, etc., circles, business is seasonable—just what is expected at this time of year, but dealers and jobbers say the outlook for good early spring business is most encouraging and they are prepared for it.

The seventh annual convention of the National Builders' Supply Association was held here February 6th, 7th and 8th, and was attended by over 200 members, from various parts of the country. Mayor Weaver welcomed the visitors, as also did Thomas Armstrong of the Philadelphia Master Builders' Exchange and others. Many interesting papers, bearing upon building, supplies, etc., were read. Thirty-eight new members were enrolled. The election of officers for the ensuing year resulted as follows: President, Gordon Willis, St. Louis; treasurer, Charles H. Classen, and eighteen vice-presidents.

At the morning session, February 6th, Prof. S. B. Newberry read an interesting paper on "Waterproof Compound."

The engineering department of Swarthmore College has let a contract for the construction of a $20,000 building for practical shop work in engineering, construction, etc. Swarthmore College is under Shaker domination. The new building will be constructed of cement blocks and made fireproof. It will be 30 by 109 feet, two stories and basement.

It is understood here that the large plant of the National Hydraulic Stone Co., at Baltimore, recently badly damaged by fire, is to be immediately reconstructed.

Many members are giving considerable attention to concrete construction on account of the noticeably increasing demand for such construction.

The Lime Manufacturers' Association this month gave a dinner at the Bellevue Stratford Hotel to the retail dealers. Speeches were made by W. B. Rambo, C. C. Cox, Charles Warner, Geo. Sinn and Walter Bodwitch. A sociable and enjoyable time was had. W. B. Irvine was the genial toastmaster.

The Monongahela Petrified Brick Co., 147 E. State street, Trenton, N. J., will manufacture and deal in cement, terra cotta, ware, etc., and although a recently organized concern is said to be doing a nice business.

The newly organized Wissahickson Mfg. Co., of Philadelphia, will deal in cement and allied products.

Samuel H. French & Co., sole sales-agents of Dexter cement, recently gave it as their opinion that high freight rates to the South were hindering the development of "Dixie."

It is stated the Delaware, Lackawanna & Western Railroad intends to additionally traverse the Pennsylvania cement belt with a new branch line. A corps of surveyors started out early this month to lay out a line from Siegfriend, through Lehigh and Berks counties to Hamburg. The new line will be 28 miles long and should prove of benefit to the cement interests in the counties named.

An explosion of pulverized coal in the grinding department of the Vulcanite Portland Cement Co.'s mill at Vulcanite, N. J., severely burned six men the past month.

A number of quarry notes which may interest concrete manufacturers are: The courts have decided that the Delaware, Lackawanna & Western Railroad cannot operate its huge stone crusher at the Delaware Water Gap. Probably the matter is not finally settled as the railroad company will appeal to the higher courts to be allowed to operate the plant. The Schuylkill Stone Co., of Philadelphia, has purchased about 3,000 acres of stone land near Birdsboro, and will, it is stated, buy almost 2,000 acres more in Chester county. The Schuylkill Stone Co. supplies builders, etc., and will, it is understood, sell crushed stone for concrete manufacturing, blocks, etc.

Hartman E. Grau, H. C. Grau and Edw. P. Bliss have formed and will incorporate the H. E. Grau Co. for the purpose of conducting a general engineering and construction business. The parties named are of established reputation and will no doubt meet with good success.

The subject of cement packages is one more than unusually interesting just now to cement manufacturers, on account of the high price of both cement barrels and cotton and burlap bags. Said a land title building cement manufacturer: "Consumers of cement want our product just as cheap as they can get it, and while we prefer shipping in wood we have to give in when our customers demand cement in bags. There's not a great deal of difference just now in the cost of barrels and cotton-burlap bags, and both being high we have gone quite extensively into the use of strong Manilla paper bags. For short shipments, where no rehandling takes place, paper bags do very well, but for long shipments and rehandling their use results in considerable wastage. Paper bags cost about 2½c apiece."

In the local courts the Keystone Cement Block Machine Co. has entered suit for alleged breach of contract against Dobbin Bros., architects and builders. A foreign attachment was issued Feb. 14th at the instance of the Municipal Engineering Co. against the Concrete Piling Co. Bail was fixed at $600.

Defective scaffolding caused an accident at Merritt & Co.'s new concrete and brick warehouse, Camden, N. J. Seven men were injured. The warehouse is of monolithic construction, reinforced with steel bars and is five stories in height.

The building laws of Wilmington, Del., are to be revised to bring them up to date. Concrete construction, it is understood, will receive due attention. The new laws will be patterned after the building laws of Cleveland.

The new coke ovens of the Camden (N. J.) Coke Co., occupying a space 60 by 200 feet, will have reinforced concrete roofs. The Ford & Kendig Co., of Philadelphia, placed an $800 armored concrete floor in their Callowhill street wrought iron supply warehouse. A reinforced concrete addition, costing $800, is being added to the business building at 1424 Chestnut street. Extensive cement pavements are to be laid about the large Highland Worsted Mills, Camden, N. J. John L. Herrman has had a reinforced concrete floor placed in his building at 42d and Aspen street. The Felton Sibley Co. is having an addition of concrete construction built at 405 Cherry street. Chalfant Bros., coal dealers, have started construction work on an $8,000 stable near Thomas avenue, to be of concrete. Charles O. Struse & Sons, of Philadelphia, are believers in concrete construction, having just taken out building permits for five good-sized concrete dwellings.

The Vulcanite Paving Co. will construct reinforced concrete floors in the new Historical Society building, at a cost of $4,800.

The John W. Allison Co., reinforced concrete construction, etc., has a number of important contracts on hand—one being a concrete floor for the Philadelphia Rapid Transit Co.'s new Frankford avenue station, to cost $3,000.

William, Jos. M., John L. and Andrew L. Steele and Thomas Jamieson have organized and will incorporate the William Steele & Sons Co., to engage in the construction of buildings of every description, including reinforced concrete, etc. The new company succeeds the old firm of Wm. Steele & Sons, which has offices at 1600 Arch street, and which has erected many important buildings, etc.

It is said the Pennsylvania Railroad will reach out and build a branch line to Allentown, Pa., and tap the cement belt nearby. Allentown merchants want such a line.

Contractor John P. Keen died at his home at Camden, N. J., the past month. He was an extensive builder of cement sidewalks, curbing, etc.

Proceedings were instituted at Easton early this month by the Knickerbocker Trust Co. of New York, trustee, against the Quaker Portland Cement Co. and others, to foreclose a mortgage for $2,500,000 on franchises and property at Sandts Eddy. The cement company, it is alleged, has defaulted in the payment of interest on money lent. It is thought the trust company will foreclose.

The Unit Concrete Steel Frame Co., 1414 Commonwealth building, will construct a reinforced concrete floor in the large factory of Julius Keller, pneumatic tools, to cost $5,000.

Wm. E. Stokes, John D. Evans and Walford Walcott are incorporators who applied for a charter at Camden, N. J., for the Atlantic and Gulf Portland Cement Co. Nothing of the new company is known in Camden. It is capitalized at $10,000.

Morris Ebert, importer and sole agent of the Mannheimer (Germany) Portland Cement Fabrik, who has been located for over 25 years at 302 Walnut street, will soon remove to a new location. Mr. Ebert states that he has a good cement testing laboratory, complete in every way, which he wishes to dispose of. He reports business quiet in German cement and, as the writer surmised from his conversation, seems to think that American contractors and builders discriminate against imported cements.

The five-story warehouse of reinforced concrete construction, built by Merrit & Co. at their Camden, N. J., plant. It is one of the few concrete buildings in Camden and has been examined by prominent business men of that city who may in turn be disposed to use concrete when they feel called upon to put up new edifices.

Monument and mausoleum work presents a large field for cement block manufacturers, and no doubt, in due time, this class of work will receive a large share of attention. It is stated a number of monuments of cement stone have already been erected in cemeteries in and about Philadelphia, and have so far given the best satisfaction. The cost being about a third less, and cement stone being as durable as the ages, in time these qualities will induce people buying monuments to forego prejudice and purchase cement stone memorial work. As pointed out by a local artist-architect, "the possibilities of beautiful work along monumental lines is limitless—and the business, once fairly started, will enlist the interest and aid of the best of American designers, architects and sculptors. Concrete, rightly mixed and properly molded, is susceptible to substantially the same uses and purposes as marble and bronze."

WM. PENN.

F. W. Stately of the Buckhorn Cement Co. of Manheim, W. Va., has made an expert examination of the Hecla Portland cement plant for Mr. Stroh of Detroit. Mr. Stroh pronounces the Hecla plant all right.

The Portland Cement Company, Portland, Colo., has authorized an expenditure of $115,000 for improvements which will increase the capacity of its plant to about 1,500 barrels per day. The machinery included in the specifications, some of which has already been purchased, consists of a 1,200 horsepower Corliss engine, 500 kw. generator, two Heine boilers, Wheeler condenser, Wainwright heater, pumps, hot wells, several Smith tube mills, motors, etc.

The plans for the Iowa Portland Cement Co.'s plant at Mason City, Iowa, promoted by J. A. Cruikshank, call for seven buildings of the following dimensions: Main building, 520x130 feet, will house the kilns and grinding machinery; stone crushing plant, 120x45 feet; coal grinding and storage, 120x60 feet; machine shop, 40x110 feet; power plant, 100x110 feet. Plans for stock house and office buildings not yet complete. All machinery is to be electrically driven. Each machine will have its own motor, supplied with current from generators installed in the power house.

CEMENT AND HYDRAULIC LIMES MANUFACTURE, PROPERTIES AND USE.

BY E. CANDELOT.

TRANSLATED BY M. GASKELL KNECHTEL.

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History.—Before the discoveries of Vicat little was known about hydraulic mortars excepting the mixtures of fat limes and Puzzalon (volcanic earth) used in parts of France and Italy; while it was well known that certain limes would harden under water, this fact did not greatly promote their use in actual practice, nor had the cause of this hardening been seriously considered.

In 1756 John Smeaton constructed the Eddystone lighthouse of hydraulic lime. This gave a great impetus to its use. G. De Morveau and Sassure sought to discover the cause of hydraulicity in certain limes and failed.

In 1813 Prof. Collette Descotils of the School of Mines found that silica in limestone while insoluble in acids became soluble when subjected to high temperature and combined with the lime and imparted hydraulic properties to the calcined compound.

Vicat made the first thorough study of hydraulic mortars, and after numerous experiments established the fact that the setting and hardening of such mortars were caused by the silica combining with the lime.

M. Merceron Vicat summarizes the Vicat works under the following fundamental law, "A hydraulic lime can be made of limestone and clay thoroughly mixed in certain proportions and then burned.

"Iron, manganese and magnesia impart no hydraulic properties. Hydraulic limes, containing only a trace of alumina, set slow.

"Silica is the essential element of hydraulicity, therefore hydraulic limes can always be made by mixing silicious clay with calcium carbonate in certain proportions and burning the mixture like ordinary limestone."

Vicat, not content with simple laboratory experiments, at once acted upon his discoveries by publishing the practical results of his investigations. He traveled through France, locating numerous suitable deposits of hydraulic material and instructed others in the method of converting these deposits into hydraulic lime, resulting in the erection of many works for its manufacture, the product of which displaced the fat lime and Pozzuolana mortars with greater economy to the trade.

Vicat freely gave his discoveries to the public in practical form, preferring, says Thenard, "the honor of being useful to that of being rich." As an engineer his aim was to advance the art of construction by placing before all constructors a practical method of manufacturing hydraulic lime. So well was this object attained, that Arago in 1845 declared "it would be difficult to name a discovery which in the short period of twenty-six years had such a wide field of application and equally useful results." All constructors and great chemists agree as to the value of these discoveries. Authentic records show that up to 1845 nearly 200 million francs have been saved by the use of Vicat's hydraulic mortars in the construction of bridges, roads and war defenses and from 1845 to 1856 the saving has probably been five times as great.

The works of Vicat date from 1812; it was not until 1818 that the results of his researches were made public. These bear principally upon hydraulic lime and Pozzuolana. As before stated they show that all limestone containing a certain proportion of clay can be converted into hydraulic lime by burning. During the burning the lime reacts upon the clay and combines with the silica and forms a silicate of lime; this salt hydrating is the essential agent in the process of hardening, the alumina and the remainder of the silica form a silicate of alumina which also hydrates; the presence of the alumina hastens the hardening yet it does not appear to be necessary for producing a hydraulic lime of good quality.

On account of the varying quantity of clay contained in a limestone the resulting product possesses different hydraulic qualities. Vicat classes limes in the following manner: Those which possess hydraulic properties in a slight and moderate degree; those that might be said to have a proper degree of hydraulicity, and those which are eminently hydraulic. Each class is designated according to the time of set and also by the index of hydraulicity, that is, the proportion that the silica and alumina bear to the lime.

The feeble hydraulic limes are those whose index is between 0.10 and 0.16; the quantity of clay contained in the limestone varying from 5.3 to 8.2 per cent; these limes set in from sixteen to thirty days. The moderately hydraulic limes have an index between 0.16 and 0.31 and are produced from a limestone containing from 8.2 to 14.8 per cent of clay, the set of these limes takes place in between ten and twenty days. The limes properly so called hydraulic possess an index between 0.31 and 0.42, providing the limestone has mixed with it 14.8 to 19.1 per cent of clay before it is burnt; the set of this takes place in from five to nine days; finally a limestone yielding a lime with a high degree of hydraulicity contains from 19.1 to 21.8 per cent of clay, the index varying from 0.42 to 0.50; the set takes place in from two to four days.

Limestones containing more than these proportions of clay furnish lime or cement having a slow set, providing the proportion of clay varies from 21.8 to 26.7 per cent, and these will have an index of hydraulicity varying from 0.50 to 0.65, but when the index is 0.65 to 1.20 the cement sets rapidly, the limestone contains from 26.7 to 40 per cent of clay.[1]

This classification is not absolute where it is essential that a limestone contain a fixed proportion of clay to produce a certain grade of hydraulic lime, the manufacture must be so conducted that the hydraulic properties of the material shall be completely developed. Consideration must be taken of the fact that limestone deposits in the quarry are not perfectly regular and that in the same kiln limestones of different indices will always be found, therefore the finished product is a mixture of limes of different degrees of hydraulicity.

In practice for important work the high and medium degree hydraulic limes are used. Limestone yielding the highest grade is quite rare, as the index of the lime generally produced seldom goes above 0.42.

It is true that limes with an index below 0.42 are often placed in this class, but they set in less than two days, as for example the Teil lime of Teil.

Not only did Vicat determine the exact conditions for producing hydraulic lime, but also that a mixture of clay and carbonate of lime in proper proportions produced, after being burned, a lime possessing the same qualities as the natural lime, but more energetic. Consequently it became possible to manufacture a hydraulic lime in almost any place. The subsequent discovery of a large number of natural deposits of limestone containing a proper amount of clay to produce a hydraulic product of good quality. These discoveries at once cut down and limited the manufacture of the artificial product, which at the present time has almost ceased.

Vicat's statistic researches upon limestone, hydraulic lime and natural cement commenced in 1824 and were published in 1853.[1] We find in the preface which preceded the results of his researches the following information.

There are at least 76 districts in which natural limestone deposits are found suitable for the manufacture of either hydraulic limes or cement, and over 900 places suitable for quarries were located in France. The value of each of these deposits for the production of either hydraulic lime or cements was carefully designated.

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[1] See "Chimie Appliquée à l'art de l-ingenieur," by M. Durand Claye General Inspector of Bridges and Roads. Baudry et Cie, editors, 1885, 2d edition, 1897.

[1] At Carilian-Góeury and V. Dalmont, quai des Augustins, 49, Paris.

The Vicat discoveries may be regarded as a series of landmarks, aiding in further researches, which subsequently produced unprecedentel results, making a veritable revolution in the builder's art by producing better and more substantial work in a much shorter time and at less cost. Although the manufacture of hydraulic lime now appears very simple, the greatest care must be taken in its production, especially where the deposits are irregular. There are few works that produce a relatively high grade product on this account.

Manufacture.—Artificial Hydraulic Lime.—At the present time the manufacture of artificial hydraulic lime is only carried on to a limited extent; the works of Moulineaux, near Paris, with an output of from 15,000 to 20,000 metric tons yearly, was established in 1826 and is now owned by M. Fauh. This hydraulic lime is produced by a mixture of pure chalk and clay. The chalk is mixed with the clay in vertical pug mills. The proportion is one part of clay to five of chalk. The mixture leaves the pug mills in the form of a stiff paste, which is cut into large regular pieces and dried in the kilns in which the burning takes place. The kilns are continuous and similar to those used in nearly all limeworks, and which will be described when dealing with natural limes.

The slaking, sifting, separation and grinding of the grappiers present no special difficulty and are treated like natural limes.

Natural Hydraulic Limes.—The manufacture of hydraulic limes includes the quarrying of the limestone, the burning, slaking, sifting and bagging.

Extraction.—The limestone used by the hydraulic lime works is taken from the Oxfordian or Neocomian strata. It is sometimes found in large beds and sufficiently homogeneous, like that of Teil, but more frequently in layers of different depths and variable composition. Frequent analyses must be made to determine which are suitable for producing a lime of good quality.

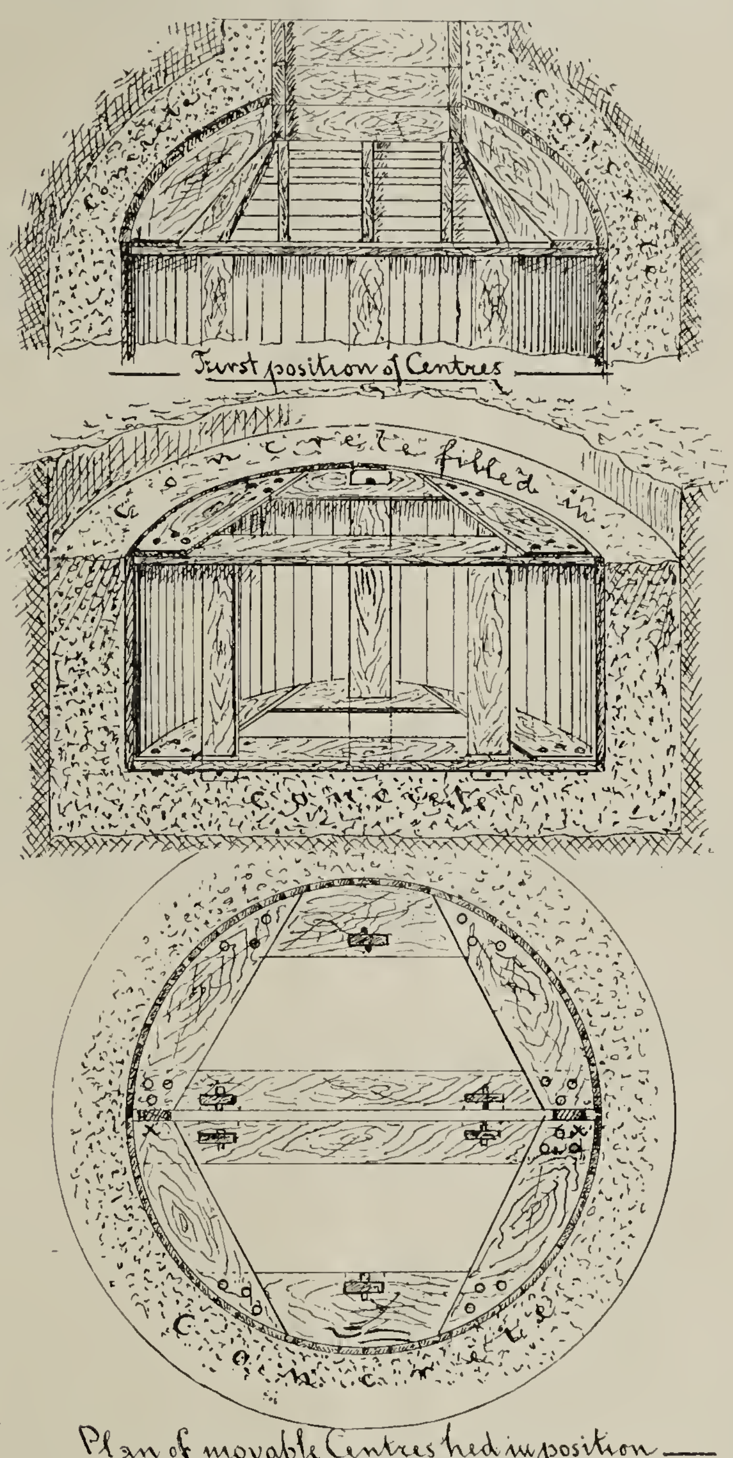
As to the value of the layers M. Bonnami says, "All practical quarry men know the great irregularity of the composition of the various layers, particularly in the vertical direction, even in the absence of all stratification. Adjoining layers, identical in appearance, differ in analyses. Those parts containing the most clay are usually the most unctuous to the touch."

(To be continued.)

THE DOMED ROOF UNDERGROUND CONCRETE TANK.

In the water preservation of the country on farms and in small towns, the storage of good cool roof water is of great importance and essential to the welfare of the people. The construction of wells and tanks that will serve for that important object should not be an unwelcome subject to bring before our readers, the more so when concrete construction and application of cement form here an essential factor to accomplish good results and reach perfection.

— Uppermost position of Centres and Frame for Dome —



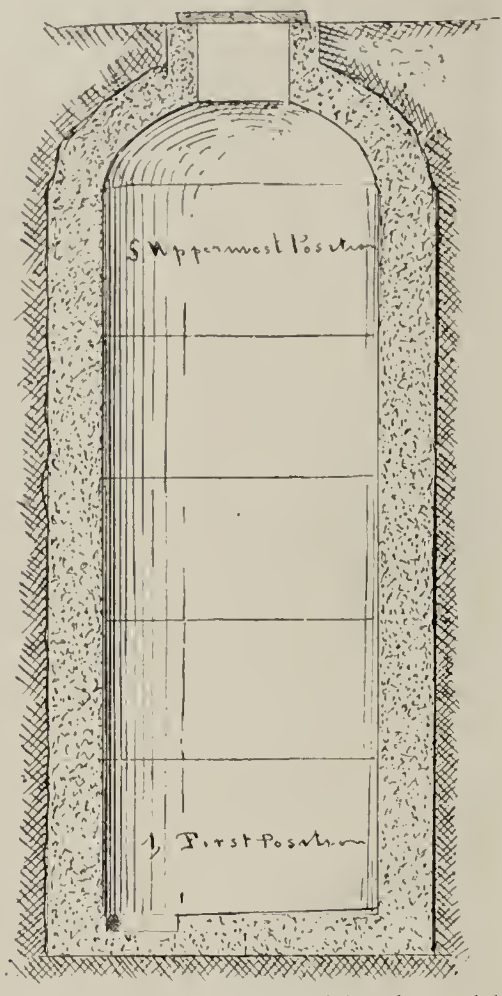
— First position of Centres —

— Plan of movable Centres held in position
— with wedges x. x. —

To construct an underground tank, strong and serviceable at a reasonable cost, is the object of the proposed mode of proceeding. The first thing we have to consider is the excavation for the proposed tank. A good stiff clay may be considered the best and most convenient soil for sinking a tank, as little shoring up the sides will be required. If sandy ground or gravel is met, of course shoring up the sides cannot be dispensed with.

The excavation must be made so together with the thickness of concrete surrounding it. The next consideration will be to put down a floor and extend the same so far as to form foundation for the sides of the tank. The floor should be made sloping slightly towards a small recess, into which the water and settlement of impurities are drained, and from which they may be easily baled out. Upon this floor the first position of the movable centers is made. The centers are constructed of 2-inch plank, as indicated in the plan of our sketch, and bolted firmly together (not nailed), for being easier taken to pieces again when required. Four semi-circular segments are made, two of them forming one-half the circumference of the tank, and are held apart in their positions by means of upright studs notched into the upper and lower semi-circular center. The outside is covered by 3x1 inch strips of such lengths as the body of the concrete is decided to be in height. For a medium-sized tank, 2 feet or 2 feet 6 inches is quite high large as to give the size of the tank, enough, to facilitate ramming in concrete, and effect a solid bed of concrete layer. Two of these framed centers are placed side by side in position, with a wedge on each side at the joint held in position to form the size of the tank, and are now ready for filling in the concrete behind the centers. The concrete being in its place, and hard, the wedges are withdrawn and the centers will slacken.

Dome Roofed underground
Concrete Tank
made with movable Centres.



The centers are now moved upwards for another position, and this operation is repeated until the last position on top is reached. In this uppermost position, the frame for a domed roof is built upon, and the concrete put all around and rammed close. Care should be taken that each additional layer of concrete is well amalgamated with the previous one. A manhole is left on top, for which a cover or lid may be constructed. This last operation being completed, the frame work of the dome is removed and the center partly taken to pieces, so that they may be taken through the manhole with part of the surrounding strips removed.

The interior of the tank is carefully covered with a coat of cement and sand in equal parts, and a cool watertight tank is produced.

Tanks of this size can be constructed in various sizes according to the quality of water to be stored. With an inner diameter of from 5 to 15 and 18 ft., the thickness of the concrete should be from 8 to 15 inches proportionately to the depth of the tank.

We will give a few sizes of tanks, and what their capacity will be to store water:

Tank 6 ft. diameter, 15 ft. deep, will hold 3,150 gal.

Tank 8 ft. diameter, 15 ft. deep, will hold 5,600 gal.

Tank 10 ft. diameter, 15 ft. deep, will hold 8,800 gal.

Tank 12 ft. diameter, 15 ft. deep, will hold 12,650 gal.

Tank 16 ft. diameter, 20 ft. deep, will hold 30,000 gal.

Tank 18 ft. diameter, 20 ft. deep, will hold 35,000 gal.

The Alph Portland Cement Co. is erecting a concrete warehouse at Martins Creek, 100x570 feet and 33 feet high, for storing cement.

WANTED DRAUGHTSMEN.

Two good draughtsmen wanted. Experienced in cement mill work. State salary and experience. Address M. M., care Cement and Engineering News.

INCORPORATED.

The American Standard Cement, Lime & Stone Co.; to manufacture Portland cement lime. Capital, $500,000. Incorporated under the laws of West Virginia. Head office, Martinsburg, W. Va.

FIRECLAY BRICK
STAR SILICA BRICK

CORNERS *in* QUALITY

We have have "cornered" the brick market—so far as **Quality** is concerned. It's an interesting story—but we have only space to outline it here:

The first chapter begins at the clay-mines. It shows how particular we are about **good raw material.** The grading is very thorough. At every step—inspection—selection—rejection, until our experts have the cream of the clay beds picked **out.**

The last chapter is a long way from the first—for it takes longer to wear out **Harbison-Walker Refractories** than any other fire-brick made.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

This is a true story—you can see the proofs any time in this office; letters from users of refractories who have set down in black-and-white facts and figures which are the most valuable records of experience ever collected in the history of fire-brick manufacturing.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

1,100,000 DAILY CAPACITY
7,000 REGULAR CUSTOMERS

No Order Too Small for Our Best Attention. None Too Large for Our Capacity.

WE HAVE EXPERT KNOWLEDGE FOR YOUR BRICK TROUBLES
ALWAYS STATE FOR WHAT PURPOSE BRICK ARE TO BE USED

SEND FOR CATALOGUE "C"

MAGNESITE BRICK
Harbison-Walker Refractories Co., Pittsburgh, Pa.
CHROME BRICK

BOOK NOTICES.

"Roofing Rules," a handbook on sheet metal in building construction for architects, owners, engineers and builders. Merchant & Evans, Philadelphia, Pa., publishers. Distributed free on application. The booklet covers Wood Shingles, Composition Roofing (Coal-tar and Felt Paper), Gravel Roofs (Slag), Terra Cotta (Clay Tiles), Slate Shingles and Cement Roofs.

The weight of the different kinds of roofing is given per square foot.

Metallic roofing, tin or copper tiles or shingles, corrugated V-crimped galvanized iron, sheet copper and roofing tin. The various roofing materials now on the market are discussed and compared with the Merchants Old Method roofing tin. Builders, contractors and engineers will find much valuable information on the subject of roofing in the booklet.

PROVISIONS AGAINST ACCIDENTS

The Monarch system of automatic devices for preventing accidents in mills and factories is described in severla pamphlets issued by the Consolidated Engine Stop Company of 100 Broadway, N. Y., which can be had on application. The Monarch system installed in a factory permits the stopping of machinery from any part of a building by pressing a push button. This insures greater safety and freedom from accidents, thereby limiting the extent of accidents to employes; in other words, it reduces the hazard to a minimum; and courts in accident cases look with favor on the latest modern devices installed in works to secure the greatest possible safety to employes, as doing away with willful negligence on the part of the employer.

Beton Kalender, 1906. A Hand-Book for Reinforced Concrete in the German Language. 616 pages. 6⅜ by 4 inches. Price 3 m. cloth. Published by William Ernst & Son, Berlin, Germany.

The book is full of valuable data on the subject of reinforced concrete, divided into three parts. Part I describes and illustrates scientific apparatus used in testing cement, together with the standard specifications for cement, both natural and artificial. Lime, gypsum and mortars, in which the above named materials are used, and concrete, with numerous tables of mixtures showing strength voids tensile and compressive strengths, waterproof qualities and other useful data, followed by thirty-two illustrations of concrete mixing machinery.

Part II. Concrete specialties, piling, foundations, retaining walls, reinforced concrete foundation, floors, tanks, columns, beams, conduits, machine foundations, concrete blocks, forms for concrete walls with bridges and arches. Concrete fireproofing, expanded metal and other reinforcing members. Culverts, hollow tile and concrete floors, domes, cement roofing tile and machinery for forming same. Ornamental ceilings, stairways, concrete tampers and polishers; in fact, all the leading systems of reinforced concrete now on the market. Concrete chimneys, concrete roadways and sidewalks with tools and appliances in use. Ornamental water tanks.

Part IV. Cost of concrete work, including hand and machine mixing. Price of materials, labor. Methods of testing tamped concrete, prescribed by the Beton Association.

The book is up to date on all matters relating to cement and the various applications, and contains several hundred illustrations.

The great French journal of Paris has issued a special automobile edition covering 330 pages, 14½ in. by 10½ in. It is an exhaustive treatise on the subject illustrated with over 500 cuts and diagrams, showing with minute detail the several parts and appliances used in automobile construction, as well as every type of modern automobile for passenger and freight service. Numerous detailed drawings showing the construction of these various types given. The motors are classified under suitable heads—gas, alcohol, petroleum and electrcity.

The number is a veritable encyclopedia on the subject of automobiles.

NOTICE.

It may be interesting to your paper to know that the demand from foreign countries for our machines is getting to be quite a factor in our business.

We have just shipped six machines to Manila, P. I., and recently received a voluntary order from the engineer's office of the government of the Moro province for one of our machines with complete outfit of accessories and attachments. The machine is to be used for making blocks for the provincial building to be erected at Zamboanga, Island of Mindanao.

We also recently made a shipment to Liverpool, England, and are daily in receipt of inquiries from Australia, New Zealand, Cuba, South America and South Africa.

Ideal Concrete Machinery Co.,
South Bend, Ind.

NEWS FROM THE PLANTS.

The Portland Cement Co. of Colorado will increase its capacity.

The Electrical Cement Post Co. of Lake City, Iowa, has filed articles of incorporation. Capital, $100,000. J. B. Smith, president.

The Marquette Cement Manufacturing Company reports a net profit of $125,000 in 1905. The following directors were elected for 1906: James H. Eckels, Chicago; N. W. Duncan, La Salle, Ill.; William Dickinson, Chicago; V. J. Duncan, Ottawa, Ill., and T. G. Dickinson, La Salle.

The Alsen Portland Cement Co. of Germany has sold its cement lands at Friedensthal, near Nazareth, Pa., to a California syndicate, represented by Dr. Irving A. Bachman, formerly of Nazareth, now of Napa Junction, Cal. A cement plant will probably be erected on the land in the near future.

The Alma Cement Company have decided to close their executive and sales agency offices in the Land Title building, Philadelphia, and remove same to Wellston, Ohio. On and after February 15th all communications should be addressed to the company at Wellston, Jackson County, Ohio.

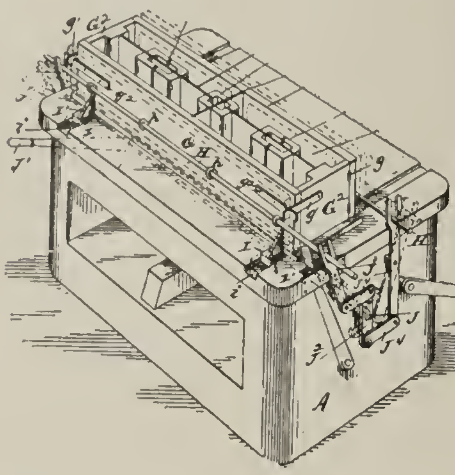
The Sacramento Bee of February 8 states that J. H. Goodwin, president of The Orvo Light & Power Co. of Orville, Butte county, Colo., and associates are organizing a company to erect a Portland cement plant near Pentz, Butte county, Colo., in connection with the 6,000 H. P. water power plant now under way at the last named point.

The Ohio Portland Cement Company expects to erect a cement plant four and one-half miles east of Wellston, Ohio; daily capacity, 1,000 barrels. V. O. Foulk, late of Cleveland, Ohio, now of Indianapolis, Ind., one of the promoters, claims the company will manufacture cement at from 40 to 50 cents per barrel. This is a rather low figure and is much below the average cost of production in the United States. D. Linn Gooch of Covington, Ky., is president of the company; J. A. Locard of Wellston, O., treasurer. The company expects to have the plant in operation in August, which will be impossible. Mr. Foulk was connected with a plant at Bedford, Indiana, whose greatest output during Mr. Foulk's connection was bitter litigation.

U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

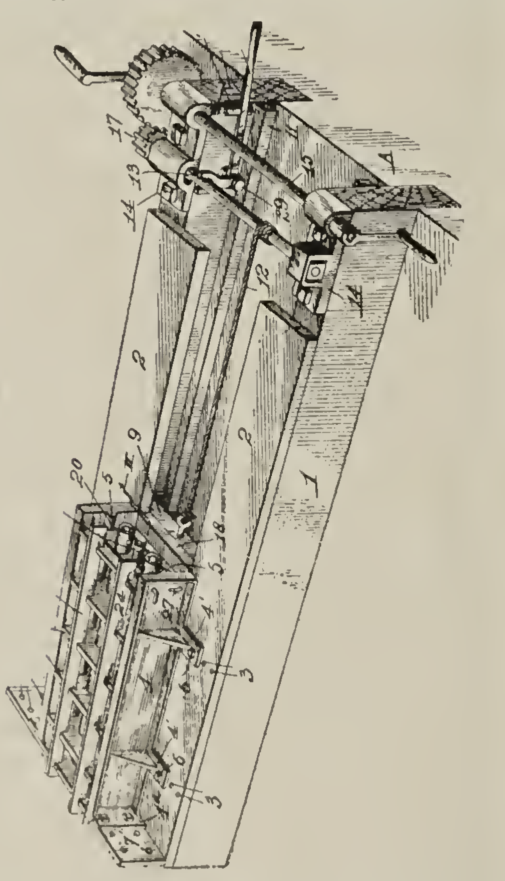
804,423. Machine for Making Cement Blocks. John Miller, Minneapolis, Minn. Filed Jan. 7, 1905. Serial No. 240,043.

Claim.—1. In a machine for making cement blocks, the frame, a molding-box having removable side and end walls supported by cleats traveling in guides formed in the frame, means for spreading the walls of the molding-box apart for the removal of the cement block, consisting of bars removably engaged to the side walls, suitable lever mechanism engaging said bars, whereby they may be forced apart or brought toward each other, and means for operating said lever mechanism, substantially as described.



804,528. Machine for Molding Cement Blocks. Thomas Fischer and James B. Talbot, Edwardsville, Ill. Filed Apr. 15, 1905. Serial No. 255,677.

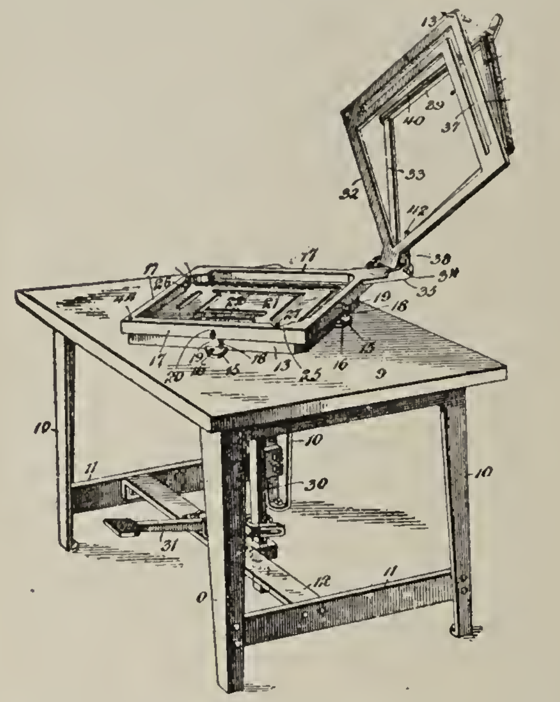
Claim.—1. In a cement-block-molding machine, the combination of a pair of bed members, a carriage arranged to ride between said bed members, a partitioned mold-box surmounting said bed members, and core-rods extending through said mold-box and supported in fixed positions independent of said carriage, substantially as set forth.



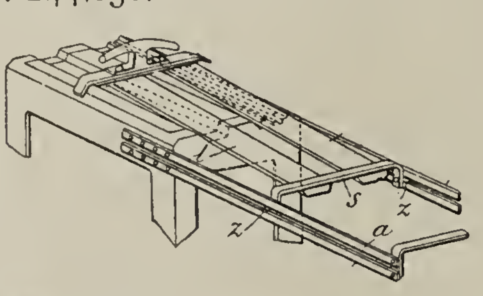
2. In a cement-block-molding machine, the combination of a pair of bed members, a carriage arranged to ride between said bed members, and a mold-box surmounting said bed members and consisting of a rear wall and side walls adjustably secured to said rear wall, substantially as set forth.

804,753. Tile - Molding Machine. Henry Meyer, Deshler, Ohio. Filed Feb. 14, 1905. Serial No. 245,617.

Claim.—1. In a molding-machine of the class described, the combination with a base having a top wall provided with recesses, of an open-bottomed mold-body receiving the base and adjustably secured thereto, a false bottom movably mounted in the body above the top wall of the base, and means for elevating the false bottom, said means including a frame movably located in the recesses and movable upwardly out of the same, and an actuating device connected to the frame and extending through the base.



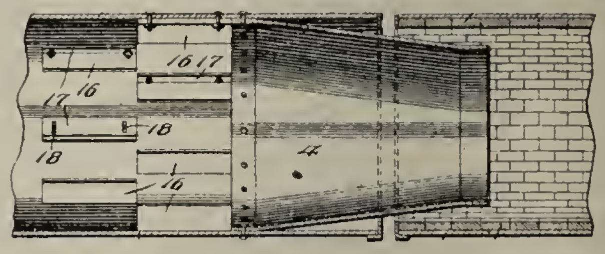
804,944. Cement-Roofing-Tile-Making Machine. Alfred Gaspary, Markranstadt, near Leipsic, Germany. Filed Feb. 3, 1905. Serial No. 244,030.



Claim.—In a beating and stamping press for making roofing-tiles or artificial stones in which the material is beaten or pressed upon a beating table or mold, a beating-iron consisting of a narrow plate provided with a handle and having the contour of the tile to be formed, longitudinal fillets or bars also shaped to the contour of the tile and connected with the plate at one
iron substantially as described.
end, a cross-bar fixed to the opposite end of the fillets and a pair of guides fixed to the table and adapted to guide the cross-bar and with it the beating-

805,213. Rotary Kiln. James H. Logan and William H. Simmons, Fenton, Mich. Filed July 25, 1905. Serial No. 271,225.

Claim.—1. A rotary kiln comprising communicating independently-rotatable sections, one of said sections being provided with agitating devices adjustable to lie at different angles to the axis thereof, and means for rotating said sections at varying speeds.



2. A kiln comprising aligned independently-rotatable sections, the delivery end of one section being provided with a chute secured therein at one end and having a reduced end projecting into the receiving end of the other section.

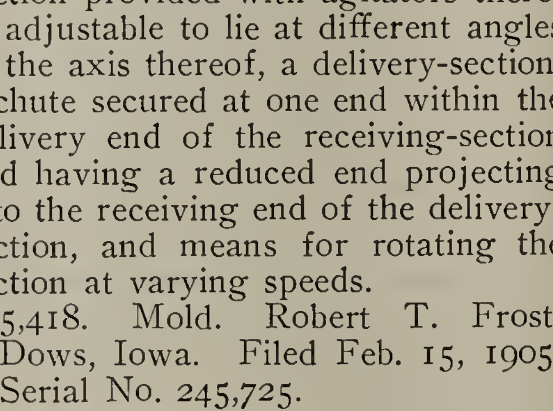
3. A kiln comprising independently-rotatable sections, the delivery end of one section being provided with a frusto-conical chute projected into the receiving end of the other section.

4. A kiln comprising a receiving-section provided with agitators therein adjustable to lie at different angles to the axis thereof, a delivery-section, a chute secured at one end within the delivery end of the receiving-section and having a reduced end projecting into the receiving end of the delivery-section, and means for rotating the section at varying speeds.

805,418. Mold. Robert T. Frost, Dows, Iowa. Filed Feb. 15, 1905. Serial No. 245,725.

Claim.—1. In a mold, the combination of a base, a mold-box upon said base and comprising separate sides and ends, a plurality of laterally-adjustable independent standards mounted upon the base, and cams carried by the sides to engage the standards, as specified.

2. In a mold, the combination of a base, a plurality of independent standards extending upwardly from the base, a mold-box composed of separate sides and ends to be held together by the standards, the cams 11 carried by the sides and ends to engage the standards, and the lugs 12 projected from the sides for co-operation with the standards to facilitate positioning of the cams 11 with reference to said standards.



WANTED AND FOR SALE ADS.

WANTED—Position as Superintendent or Constructing Engineer. Graduate M. E. with several years' experience in design, construction and operation of wet and dry process cement plants. Now superintendent of plant. Open for position after January 1st. Best recommendations from former employers. Address "Superintendent," care Cement and Engineering News.

WANTED

CEMENT CHEMIST, with seven years' experience in Germany and this country. Familiar with dry and wet process, desires change. Address M. G. 30, care Cement and Engineering News.

GENTLEMAN with 15 years' experience in inside management of large mills, and sales both in United States and abroad, now open for similar position. Address "Portland," care of CEMENT & ENGINEERING NEWS.

AFTER August 1st, will be open for position of chief chemist. Have had successful experience in handling both cement rock and clay. Received early training at one of the largest mills in the Lehigh Valley. Competent to develop new location and produce first class product. Address, "E. J." care CEMENT & ENGINEERING NEWS.

POSITION WANTED.

A thoroughly practical cement chemist is open for engagement. Technical training and mill experience. Address Box A. O., CEMENT AND ENGINEERING NEWS.

POSITION WANTED—Technical cement chemist and engineer of the broadest experience in cement manufacture, desires position. Address "Experience," care of CEMENT & ENGINEERING NEWS.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

WANTED:

Agency for a reliable Portland cement, for Chicago and vicinity, by parties in touch with leading contractors and cement consumers. Address "B. & B," care of CEMENT AND ENGINEERING NEWS.

FOR SALE

Cement property in Maryland consisting of about 150 acres underlaid with cement rock, which produces the best natural cement brought to the attention of the United States Government. For further information, address, Box 780, Springfield, Ohio.

A CONCRETE expert, with six years' experience in general concrete construction and several years' successful experience in designing block and other concrete machinery and block construction, is open for an engagement with first-class parties. Good references. Address "O. K.," care of CEMENT & ENGINEERING NEWS.

REQUIRED—Prices f. o. b., Atlantic port, and literature for plant and machinery for equipment of 1,200 barrel per week Portland Cement Factory abroad. Address A. O. VINCENT, Richmond Rd., Stechford, Birmingham, Eng.

POSITION WANTED — By young man thoroughly experienced in the office end of cement manufacturing, and with over one year's experience as superintendent of small plant. Best of references. Address E. D. T., care of CEMENT & ENGINEERING NEWS.

A Cement Chemist with six years' successful experience as head chemist in Portland cement manufacture, would like change of location. Experience in wet and dry process mills and with marl, rock, slate and clay materials. Can introduce modifications of wet process kilns that will increase output at least 50%. Can also do draughting of cement machinery. Address S. E., care CEMENT & ENGINEERING NEWS.

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¶If your profits from the manufacture of Concrete Building Blocks are not as large as you would like send for our circular illustrating ornamental stone made by our special moulds. ¶The column shown in this ad may be made for a fraction of the cost of wood columns of similar design. Several hundred per cent profit may be made by producing the line of ornamental stones illustrated in the above circular. ¶Write to-day as there will be a change in prices in the near future.

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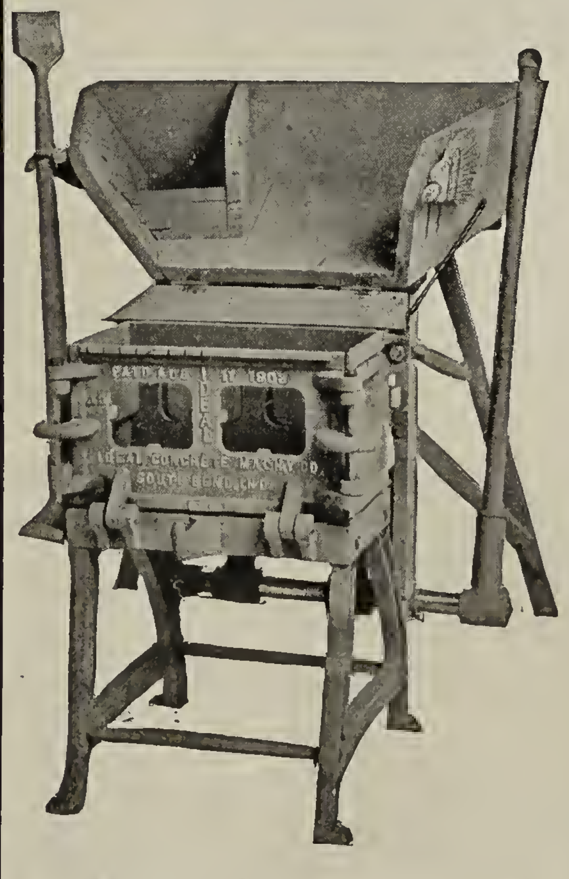

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Concrete Block Machine

Not a new machine. Tried and tested over two years. Satisfied users everywhere. Interchangeable to various widths. Adjustable to sixteen lengths. No wheels, cogs, gears, chains or cranks.

Nothing to Clog, Break,

or get out of order, Simplicity, Rapidity, Adaptability, Durability. Face formed in bottom of mold. Cores withdrawn horizontally by lever. Guaranteed Capacity—Two men, 10 hours, 200 blocks. Portable—Can be carried by two men. Over 200 in use in the State of Indiana alone. The only machine by which can be accomplished the facing of blocks by the Borst System. A business proposition to the maker of blocks. An appeal to the common sense judgment of the builder. In corresponding with us we make our business your interests.

Ideal Concrete Machinery Co.,

South Bend, Ind.

F. J. FITZSIMMONS, 819 Chamber of Commerce Bldg., Chicago Representative.

WANTED—A position as Assistant Chemist. One year's experience on dry process. Good references. Address R. E. R., care CEMENT & ENGINEERING NEWS.

HEAD BURNER, with good experience in both wet and dry processes, desires to change position on January 1st, 1906. First-class references furnished. Address T. J. G., Alsen, Green Co., New York.

SEND FOR A COPY—"How to Use Portland Cement." The English Translation of the German Portland Cement Manufacturers' Publication. No user of cement should be without a copy of this standard authority. Sent postpaid on receipt of 50 cents. See advertisement.

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A Monthly Journal of Practically Applied and Analytical Chemistry, Edited by Richard K. Meade.

Contains frequent papers on the manufacture, analysis and testing of Portland Cement.
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Abundance of High Grade Materials!

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PROXIMITY TO BEST MARKETS!

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For further information address:

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INDUSTRIAL COMMISSIONER
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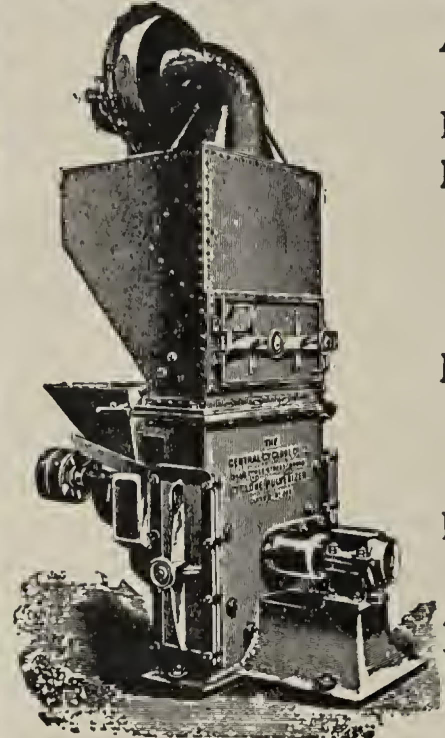
"Cyclone"
Coal Pulverizer



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PRODUCT is so uniformly fine that ALL or 98%, or 90%, or any other percentage (according as the machine is "set") will, if tested, pass through a sieve of the mesh required.

NO DRYING OF THE COAL is required before grinding unless it contains more than 15% of moisture. The AIR used absorbs and carries off moisture.

RECEIVES COAL in pieces of large size and reduces it quickly to powder.

ANY MESH of powder desired.

USED BY some of the largest Portland Cement Works in the World.

A Larger Output Per H. P. Than Any Other Machinery in the Market.

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For CEMENT WORKS
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ARE THE RAW INGREDIENTS WHICH MIXED IN THE PROPER PROPORTIONS MAKE THE
HIGHEST GRADE
PORTLAND CEMENT

We have 400 acres containing an inexhaustible quantity of these materials; located on two trunk lines; low freight rates; steady demand for the product; unusual facilities for exporting; an abundant water supply, combine to make this the most attractive proposition ever offered for the location of a

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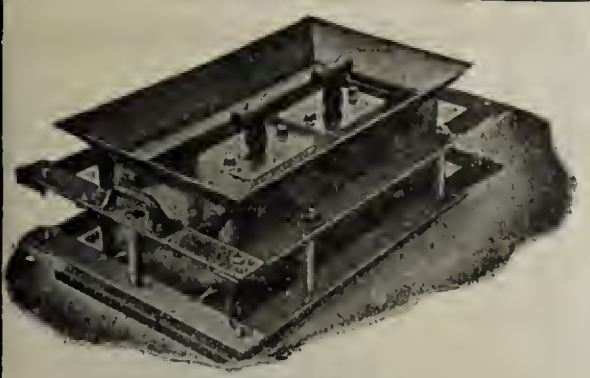
For further information address the undersigned, who will gladly submit samples of the materials together with an analysis.

J. W. WHITE,
General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.



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BLOCK MACHINE
1 MAN CAN MAKE BLOCKS PER DAY 200
NO CARRYING OFF BLOCKS. NO IRON PALLETS. NO COGS OR SPRINGS.
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Quality unexcelled. The Recognized Standard American Brand. Always Uniform.
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No Other Method Approaches It in Any Particular.

The simplicity of operation and perfection of results attained, places it at once **far and away** beyond reach of competition. Send for Illustrated Catalogue explaining everything in detail. Write to-day, it will only cost you 2c to find out all about it. For nearly two hundred years inventors have been trying to discover a means to create a **perfect** bond between the atoms of the stone composition, but no until now has this been accomplished. We cannot explain all about this great invention in a brief advertisement, and therefore ask a careful reading of our literature before you invest a cent in any other process.

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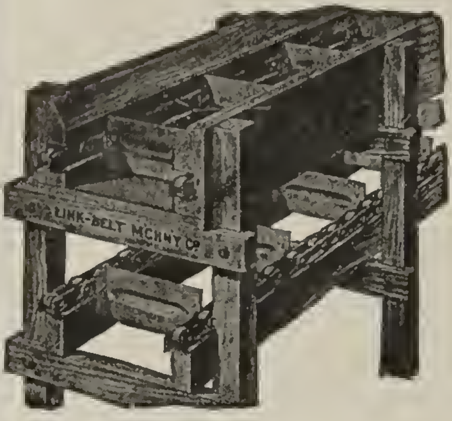

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Equipped with the
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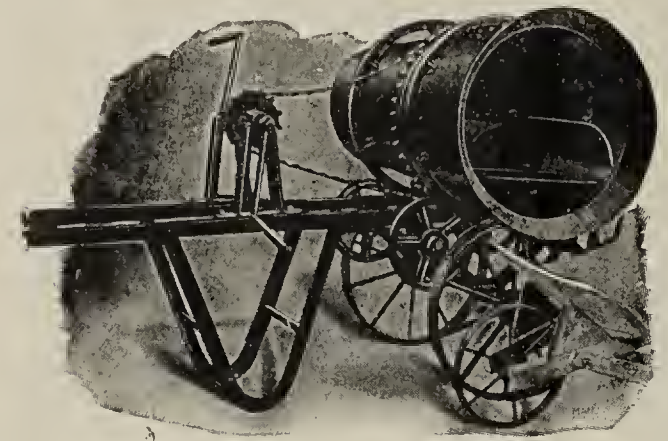

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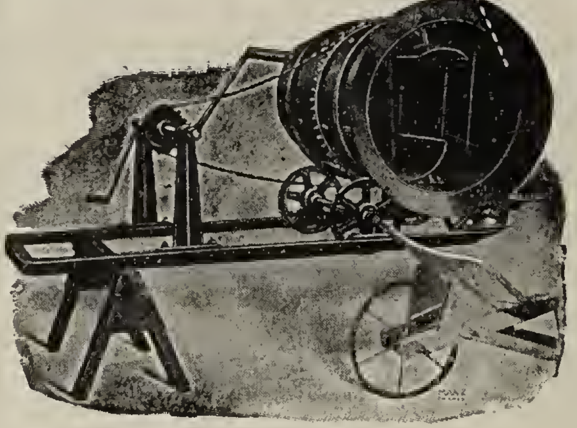

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Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

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10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

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A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

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We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
Write for Catalogue D. Washington, D. C.

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July November
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1897
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February June
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April September

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1899
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They were astonished—they were amazed! And no wonder. They saw a machine so simple in construction that not a cog, a chain, a spring, a bolt nor a pin entered into its make-up.

They saw the adjustments so easily and quickly made, that many who had heretofore been prejudiced in favor of other machines freely admitted that the Hercules had them all beat from every point of view,

Skilled labor is not required with a Hercules, for the machine is so simple that any man with ordinary intelligence can operate it.

The Hercules, by a clever combination can make two stones of the same size and design, or of different size and design, at one time; an arrangement that cuts the cost of labor in two, doubles the capacity of the manufacturer and saves the cost of purchasing two machines.

Tamping is done directly on the face, which means a clear impression of the design, and gives the stone a more natural appearance. Tamping on the face allows a 2 to 1 composition for facing, and a 5 to 1 for backing, which means a great saving. It also allows the making of the mixture more wet which means a stronger stone.

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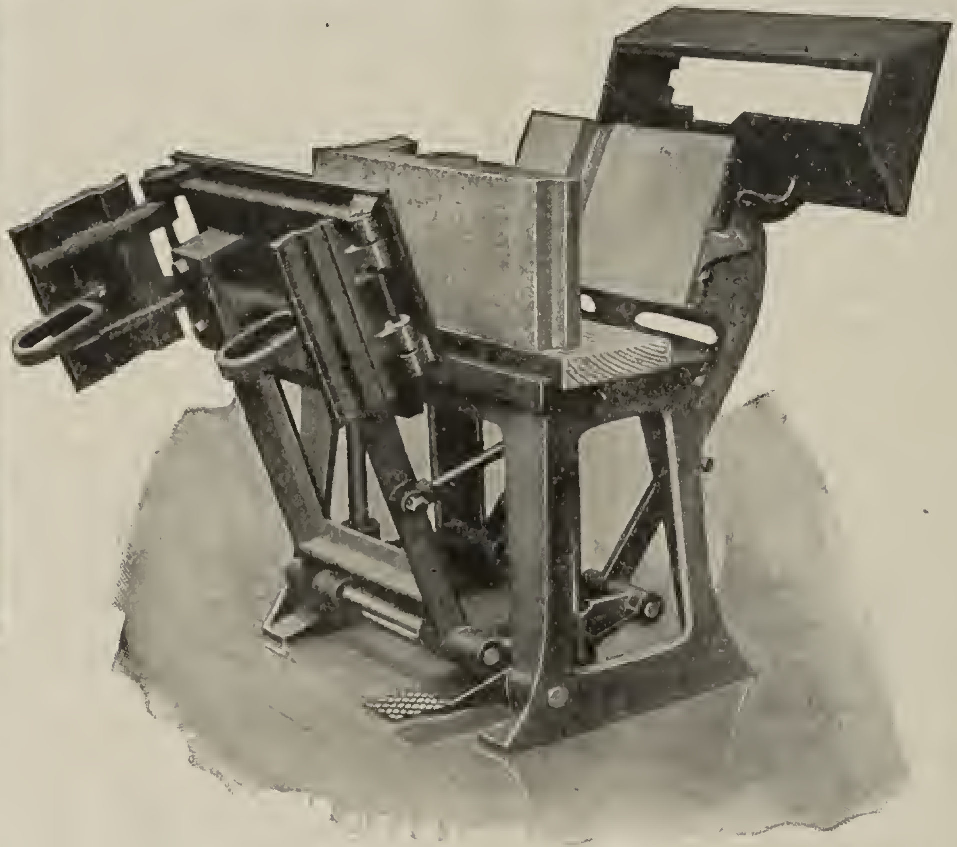

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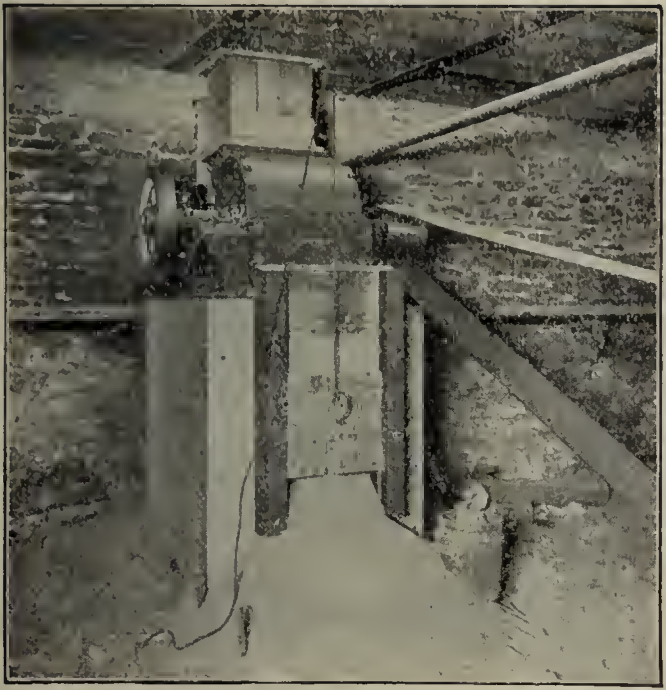

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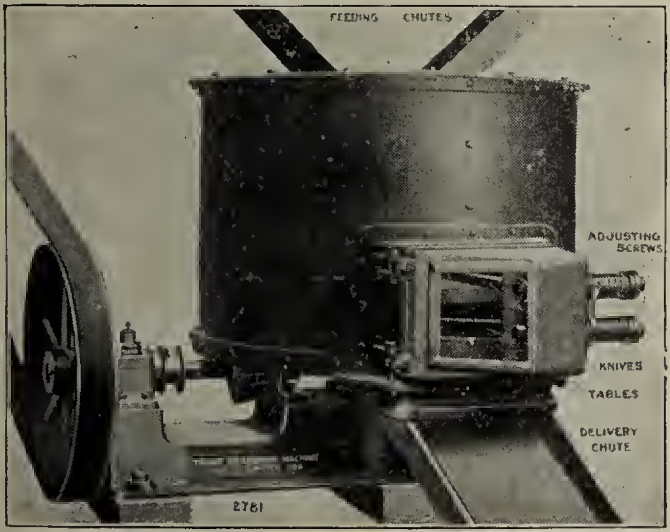

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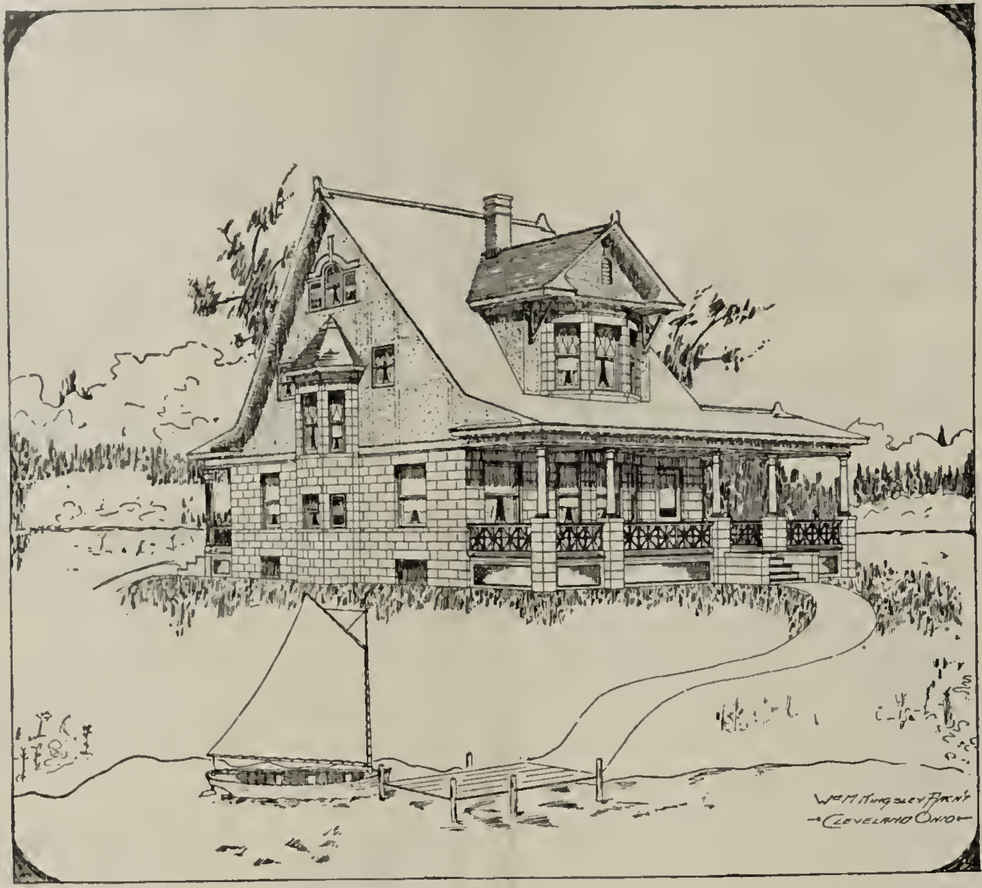

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PERSPECTIVE OF

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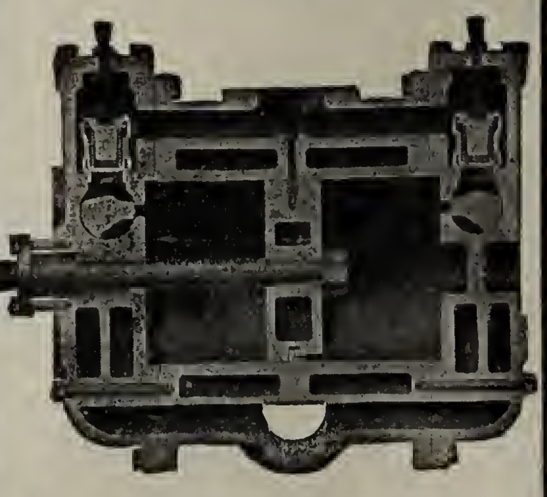

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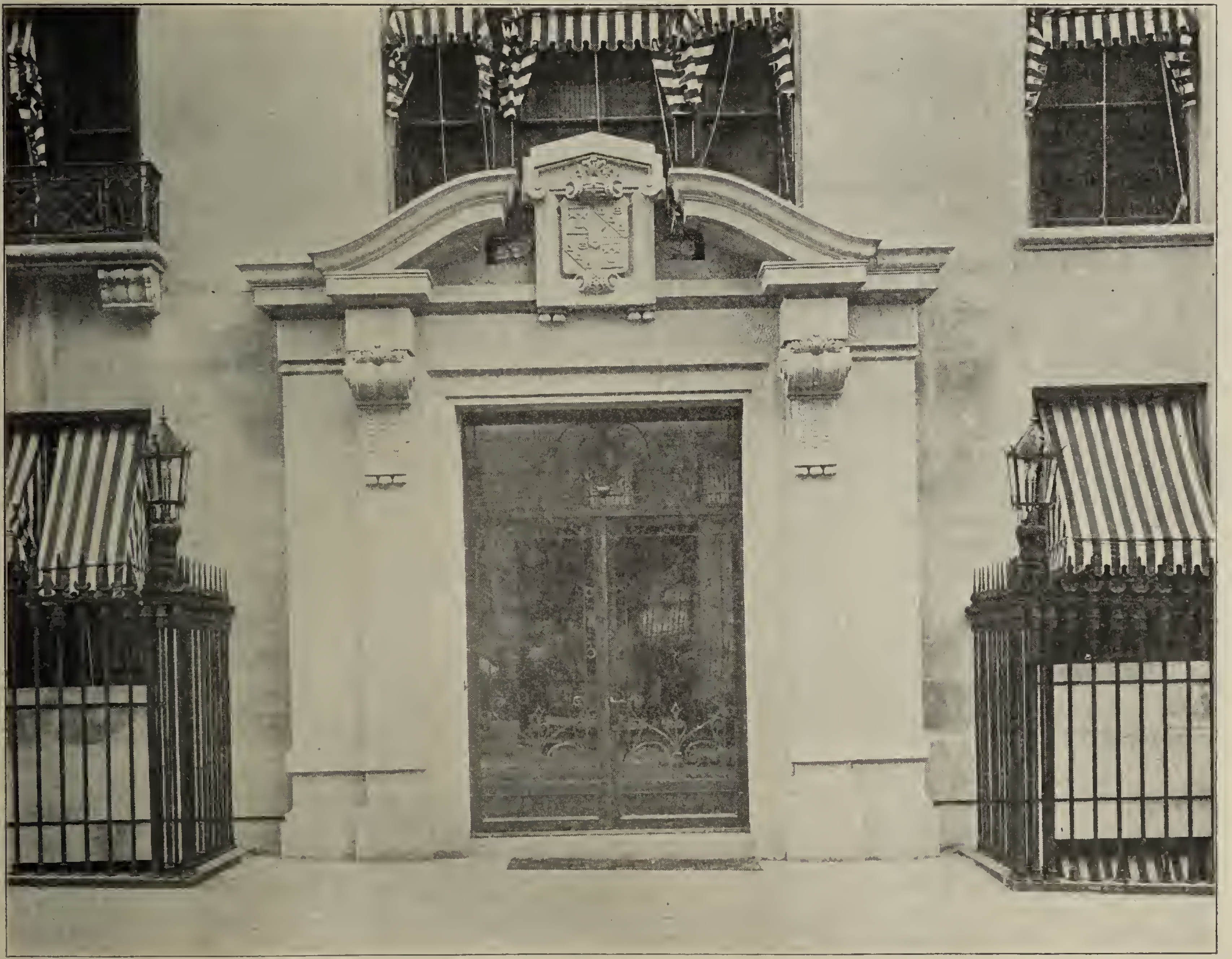

Concrete Entrance to Apartment Building. Cast in Roman Stone. Stevens Process.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
OFFICE—226 La Salle Street.
Cable Address—"Seafert." Chicago.

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"This world belongs to the energetic."

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, MARCH, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

OUR LIMITED IRON ORE RESOURCES

The iron resources of the United States will be exhausted in fifty years according to statistics compiled for the Swedish parliament, while the Misaba range iron ore deposits will be depleted in twenty-five years. What then? Where shall we turn for materials of construction? The timber resources of the country are already on the decline. Longer hauls and higher prices confront the consumer of to-day. We have used our iron and timber resources as if they were inexhaustible. Our great railways are taking time by the forelock, by planting timber forests that will serve for replacing ties on their right of way. The government is promoting timber planting. In Europe, especially in Germany, this question has been carefully considered. For the past 75 years, laws have been in force compelling every person, cutting down a tree, to plant two in its stead. The German forest areas are on the increase instead of decline. No such systematic effort can replace our iron resources, therefore we must look elsewhere for a substitute for iron and steel. This substitute is concrete. The depleting of our iron resources, means the ushering in of the concrete age. In twenty-five years, iron and steel will only be used where it is absolutely necessary; as for machinery construction and for rails. While modern structural steel sky-scrapers, railway and highway bridges, must and will be constructed of concrete with a minimum of steel scientifically arranged and imbedded therein, and known as reinforced concrete. This form of construction will in the near future be the rule and not the exception as at present. People talk of this being the concrete age. It is no such thing. It is simply a dream which future generations alone will realize. At present we are in the age of iron and steel. Its progress has been so vast and extensive that it will exhaust itself in half a century. It is now in its prime, this age of iron and steel. Men now living will witness its decline. Its life has been measured in cold figures which cannot be denied. Steel and iron must and is making way for the age of concrete. The foundations for the cement age are being laid to-day, upon which a superstructure will rise that will indeed represent the age of concrete. To-day it is simply a fringe on the borderland of our industrial energies, gradually pushing inward, never losing the ground it has made. Its destiny is to girdle the earth with its conquests. This is its mission, which must and will be fulfilled before it can be crowned as the Age of Concrete.

THE AETNA PORTLAND CEMENT CO. FORECLOSURE SUIT.

Default in interest payments at two successive semi-annual periods, June and December, 1905, brought on the foreclosure suit in Flint against the Detroit and Aetna Portland Cement companies.

The business was first organized in June, 1900, as the Detroit Portland Cement Co.; $400,000 in bonds were issued and the plant at Fenton, Mich., constructed. In April, 1903, the Aetna Portland Cement Co. was organized to take over the Detroit company's plant and business. Walter E. Oxtoby of Keena, Lightner & Oxtoby, who has charge of the foreclosure proceedings, said of the cause leading to the foreclosure suit:

"Cement was $2 a barrel when the company was first organized. It is now much lower."

The stock and security holders are mostly eastern people. The following are Detroit stockholders in the Detroit Portland Cement Co.: F. C. Andrews, H. J. Paxton, B. Stroh, C. N. Branard, G. A. Lendke, J. T. Wing, J. W. Thompson, C. L. Brume, Kate E. Rathbone, Herman Kiefer, E. Stange, T. L. Backus, C. F. Backus, L. J. Kretchmer, W. H. Allison, Bertha Fulers, C. A. Strunger, Fred Kiebler, E. S. Paxton, Otto Rosenbusch and J. A. Myers, all of Detroit, and several in Fenton and Grand Rapids.

Treasurer Myers of the Aetna company says his company is not incommoded at present by the suit, but will continue to do business at 100 cents on the dollar until the foreclosure sale is held. The expectation is that a syndicate will be formed, mainly consisting of Aetna stockholders, to buy in the plant at the sale. The Detroit company would then pass out of legal existence and a reorganized corporation would operate the mill free from debt.

CONNECTICUT CEMENT DEALERS' CONVENTION.

The second annual convention of the Cement Dealers' Association of Connecticut was held at Hartford, March 15. W. H. R. Dubois of Bridgeport presided.

The president's report showed the trade to be in a prosperous condition, and a large increase in the membership of the association. Practically all the large lime, cement and sewer pipe dealers in Connecticut are members at the present time.

The following officers were elected:

President—F. H. Johnson, New Britain.

First Vice-President—A. A. Jackson, Hartford.

Second Vice-President — A. H. Chappell, New London.

Treasurer—E. B. Bronson, Winsted.

Directors for Three Years—W. L. Damon, New Britain; F. S. Bedwell, Windsor Locks; G. N. Dean, Stamford.

Mr. F. H. Johnson, the new president, is one of the leading business men of New Britain and secretary of the business men's association of that city. The meeting of the association closed with a banquet, at which the new president presided.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JANUARY				TWELVE MONTHS ENDING JANUARY			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	6,664,000	$ 20,945	67.200	$ 231	6,997,424	$ 22.910	6,830,780	$ 21,936
Belgium...........	14,117,738	46,342	1,786,041	4,096	106,340,663	350,439	71,467,468	221,084
France............	595,200	2,554	1,787,800	6,124	5.511,299	21,713	5.307,160	19,570
Germany..........	13,184.900	36,535	18,941,739	65,914	149.520,170	503,494	131,773,306	442,683
All Other Europe	1,962	5	....	....	1,226,901	4,219	....	....
British North Am.	....	....	....	....	144.915	763	39,650	247
Other Countries..	40,000	164	6,000	60	1,869,264	7,156	53,855	498
TOTAL......	34.603,800	$106.545	22,588,780	$76,425	271,610,636	$910,694	215,472,219	$706,018
Domestic Exports of Cement, bbls.	42,152	$64,694	43,782	$72,665	631,585	$902,542	592,167	$813,424

There were 11,090,814 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in January 1905, valued at $35.554, against 7,624,551 lbs. in January 1906, valued at $21,504.

For 7 months ending in Jan. 1905, there were 75.859 tons of asphalten imported in the United States, valued at $342,012, against 40,109 tons imported in 7 months ending Jan. 1906, valued at $174,401.

STANDARD RIGHT-OF-WAY FENCES WITH WOODEN POSTS.[*]

1. Three classes of smooth wire fences may be used, the top wire of each to be 4 ft. 6 in. above the ground.

2. First-class fences shall consist of nine longitudinal, smooth, coiled, galvanized steel wires; the top and bottom wires shall be No. 7 gage; intermediate and stay wires shall be No. 9 gage.

The spacing of the longitudinal wires shall be, commencing at the bottom: 3, 4, 5, 6, 7, 8, 9, and 9 in. The bottom wire shall be 3 in. above the ground, and the stay wires shall be spaced 22 in. apart.[†]

3. Second-class fences shall consist of seven longitudinal, smooth, coiled, galvanized steel wires; the longitudinal wires and stay wires shall be No. 9 gage.

The spacing of the longitudinal wires shall be, commencing at the bottom, 5, 6½, 7½, 9, 10 and 10 in. The bottom wire shall be 6 in. above the ground, and the stay wires shall be spaced 22 in. apart.

4. Third-class fences shall consist of four longitudinal, smooth, coiled, galvanized steel wires; the longitudinal and stay wires shall be No. 9 gage.

The longitudinal wires shall be spaced 14 in. apart; the bottom wires shall be 12 in. above the ground, and the stay wires shall be spaced 22 in. apart.

MATERIAL.

5. Posts shall be of (to be filled in by each road). They shall be straight and free from rot or other defects. Split or sawn posts may be used in localities where round posts are not economically available; their dimensions shall be at least equal to those hereinafter specified for round posts.

6. End or gate posts and intermediate bracing panel posts shall be 9 ft. long and 8 in. in diameter at the small end, or 8x8 in. if sawn.

7. Intermediate posts shall be 8 ft. long and not less than 4 in. in diameter at the small end.

8. Braces for end posts, gate posts and intermediate brace panels shall be of 4x4 in. common lumber, 12 ft. long, free from large knots, splits or rot.

9. All woven wire fences shall be constructed of steel galvanized wire.

All longitudinal wires shall be coiled.

The elastic limit of all wire shall be at least 1,500 lbs. for No. 9 gage wire, and 2,000 lbs. for No. 7 gage wire.

The ultimate tensile strength shall be at least 1,800 lbs. for No. 9 gage wire, and 2,500 lbs. for No. 7 gage wire. It must stand without sign of fracture, winding tight around wire of the same size.

10. All stay wires shall be straight and of No. 9 gage.

11. The locks or fastenings at the intersection of the longitudinal and stay wires shall be of such design as will prevent them from slipping either longitudinally or vertically.

12. Staples used in posts shall be 1 in. long for hard wood, and 1½ in. long for soft wood, and be made of No. 9 galvanized steel wire.

13. All galvanizing shall consist of an even coating of zinc, which shall withstand one-minute immersion tests in a solution of commercial sulphate of copper crystals and water, the specific gravity of which shall be 1.185 and whose temperature shall be from 60 to 70 deg. F. After each immersion the sample shall be washed immediately in water and be wiped dry. If the zinc is removed, or a copper-colored deposit is formed after the fourth immersion, the lot of material from which the sample is taken shall be rejected.

14. The fence shall be so manufactured as not to remove the galvanizing nor impair the tensile strength of the wire.

15. End posts shall be set vertical, at least 4 ft. in the ground, thoroughly tamped, braced and anchored.

16. Gate posts shall be set vertical and braced in a similar manner to the end posts.

17. Intermediate posts shall be set at least 3 ft. in the ground, and from 16½ to 33 ft. apart, depending upon the nature of the ground and the service required. Holes of full depth must be provided for all end and gate posts, even if blasting must be resorted to. For intermediate posts, where rock is encountered, not more than two adjacent posts shall be set on sills 6x6 in. by 4 ft. long, braced on both sides by 2x6 in. braces, 3 ft. long. Holes must be provided for all other posts.

All posts shall be set with the large end down.

All posts shall be set in perfect line on the side on which the wire is to be strung. After the fence is erected, the top of the posts shall be sawed off with a one-fourth pitch, the high side being next to the wire and 4 in. above it.

18. All end and gate posts shall be anchored by gaming and spiking two cleats to the sides of the posts, at right angles to the line of fence, one at the bottom and the other just below the surface of the ground. The cleat near the ground to be put on the side of the post next the fence and the bottom cleat to be put on the opposite side.

Intermediate posts set in depressions of the ground shall be anchored by gaming two cleats into the side near the bottom of the post, same to be properly spiked.

19. All other cleats shall be 2x6 in. by 30 ft. long, of common lumber.

20. All end, corner and gate posts shall be braced by a piece of 4x4 in. common lumber, gained into the end corner or gate post, about 12 in. from the top, and into the next intermediate post, about 12 in. from the ground, and be securely spiked. A cable made of a double strand of No. 9 soft galvanized wire looped around the end post at the ground line and around the next intermediate post, about 12 in. below the top, shall be put on and twisted until the top of the next intermediate post is thrown back at least 2 in.

21. Longitudinal wires shall be stretched uniformly tight, and be parallel; stays shall be straight and vertical and be uniformly spaced.

The wires should be placed on the side of the post away from the track, except on curves, where they should be so placed that the pull of the wires is against the post.

22. All staples shall be set diagonally with the grain of the wood, and be driven home tight. The top wire shall be double stapled.

23. Approved bolt clamp splices or a wire splice made as follows may be used: In making wire splices the ends of the wires should be carried 3 in. past the splicing tool and wrapped around both wires backward toward the tool for at least five turns, and after the tool is removed the space occupied by it be closed by pulling the ends together.

COMPOSITION—AND A PRACTICAL METHOD FOR DETERMINING THE VALUE OF CLAYS SUITABLE FOR THE MANUFACTURE OF CEMENT.

BY CHARLES DELAVAN QUICK, CEMENT EXPERT, WELLSTON, O.

In any examination of a clay with a view to determining its value for the manufacture of cement, the really vital question is, Will it under conditions practically obtainable combine with the essential calcareous element to produce a satisfactory cement? If it has the proper composition the ease or difficulty with which it can be handled are the only remaining factors in determining its value. It seems to have been the custom with those called upon to answer these questions to resort to an ultimate chemical analysis and possibly a "test burn" in the laboratory, and then to cut and try. Needless to say, this has proved in many cases a very expensive method of learning the character of materials, which then must be used, be they good or bad.

---

[*] Standard specifications adopted by the American Railway Engineering and Maintenance of Way Association, Chicago, March 22, 1906.

[†] When desirable 1x2-in. wooden stays, stood on the ground and interlaced between the longitudinal wires, may be used, spaced 6 to 8 ft. apart, in place of or in addition to the stay wires.

To understand, even in a general way, the character of clays, or to know what they might be expected to contain, it is necessary to consider the sources from which they have been derived. Clay is a complex aggregate, resulting from the decomposition of various aluminum silicates. Its character is dependent upon the character of the rock in which it originates, and since there are a large number of igneous rocks such as granite, dolerite, trachyte, diabase, porphyry, and others, which on decomposition yield clays, the extremely heterogeneous nature of even a primary deposit is not surprising. After being subjected to the action of the elements in wearing away and redisposition, infiltration, leaching out of some constituents, and in many cases metamorphism, the character is again modified, and we have secondary clays of still more varied composition.

The principle source of clay is the group of minerals known as feldspars of which orthoclase may be taken as typical. It decomposes to form kaolinite. Generally some of the feldspar remains undecomposed, also micaceous minerals are found unaltered, and invariably there is a certain amount of quartz. The iron carrying minerals such as augite, magnetite, limonite, and pyrites are often present, and small quantities of various other impurities such as sulphates and carbonates. Taking these facts into consideration we may expect to find four kinds of mineral matter, besides the various impurities, in all clays:

1..............Kaolinite.
2..............Feldspathic minerals.
3..............Micaceous minerals.
4..............Quartz.

Kaolinite forms the greater portion of the various mixtures.

Considering the type feldspar orthoclase ($K_2A_2Si_6O_{16}$) we see it has a percentage composition of:

Silica	64.7
Alumina	18.4
Potash	16.9

and the koalinite ($Al_2O_32SiO_2,2H_2O$) resulting from its decomposition:

Silica	46.4
Alumina	39.7
Water	13.9

The principal mica is muscovite, which is found in clays almost wholly undecomposed. It has the approximate composition:

Silica	46.50
Alumina	34.00
Alkalies	10.00
Water	4.65
Iron and impurities	4.85

The quartz in clays is found in particles of all sizes and in amount it varies from 2 and 3 per cent to 40 and 50 per cent. In clays suitable for making cement there is always a relatively large amount, as will be shown further on; the average clay contains from 15 to 25 per cent. There is also an average of 5 to 8 per cent of ferric oxide, alkalies, and various impurities which taken together may be classed as fluxing agents.

In regard to the content of free silica, which point is vigorously contested by many experts, it is only necessary to consider the composition of the other elements of clay as given above. Orthoclase has a ratio of alumina to silica of .28:1; kaolinite, .85:1; and muscavite, .75:1. Kaolinite forms what is called the "clay substance" in rational analyses and is the principal constituent. If a cement were made using pure kaolinite as the clay base, a certain proportion of alumina would be introduced, vis., .85 alumina to 1 silica; if from pure muscavite, .75 alumina to 1 silica; if from pure felspar, which, however, is never but a small part of cement clays, .28 to 1 silica. It is needless to say that except with the last ratio, .28 to 1, a proportion of alumina far in excess of that found allowable in practice would result. Therefore it is evident from the very nature of the component parts of clay, that a considerable quantity of free silica must be present in all clays which are suitable for the manufacture of cement.

Just how much free silica is generally present can be approximately seen by calculating the proportions of silica, alumina, lime, etc., in the average cement, regarding the alumina as unity, and comparing the resulting formula with that of kaolinite. An average of seven American Portland cements gives a percentage of:

Silica	21.50
Alumina	7.78
Oxide of iron	3.22
Oxide of lime	62.25
Oxide of magnesia	2.60
Sulphuric anhydride	1.68

to which the formula, Al_2O_3, $4.70SiO_2$, $.26Fe_2O_3$, $14.70CaO$, $.68MgO$, $.21SO_3$, will be found to correspond.

The average clay base has then the formula Al_2O_3, $4.70SiO_2$, $.26Fe_2O_3$, showing in comparison with kaolinite (Al_2O_3, $2SiO_2$, $2H_2O$), $2.70SiO_2$, to be silica as such. A comparison with the other aluminum silicates of which clays are composed shows a similar ratio, so the statement that a clay to be suitable for making cement should contain no free silica is therefore absurd, in view of the fact that such a clay could not contain within 15 to 20 per cent of the necessary proportion of silica. Though as much silica as possible should be in a state of chemical combination, the alumina must be kept within the bounds found allowable by practice, which makes it absolutely essential that there be present a relatively large amount of free silica. Of course the greater division of the free silica the better, as the ease with which it is attacked by the bases during the process of burning is directly dependent on the state of division, and if it is not naturally fine it must be made so by grinding. Important service in helping to bring about the desired combination between lime and free silica is rendered by the fluxing agents, iron oxide and the alkalies and of just how much service is the iron is only recently being appreciated.

Considering the necessary proportions of alumina and silica and the fluxes required, the following limits of composition for clays to be used in cement making may be laid down: The ratio of silica to alumina in per cent must be not more than 4 to 1 or less than 3 to 1, and the sum of the silica and alumina not greater than 87.50 per cent of the entire clay base, when dried at 100° C.

Experience has proved that of two clays having practically the same chemical composition, one may be, on account of other properties not disclosed by an ultimate analysis, far better suited than the other for use in making a cement mixture, which certainly suggests the necessity of some test that will indicate which clay is the best for this purpose. If the conditions which exist in the actual burning of cement are imitated in the laboratory, and the clay be ignited in a platinum crucible with an excess of calcium oxide, at the temperature obtainable with an ordinary blast lamp, it will be found that while a sufficient temperature was not reached to produce complete chemical combination, still the condition of a large part, if not all of the silica of the clay is radically changed. It will be found that it has become soluble when treated alternately with hydrochloric acid and caustic alkali. *Directly on the proportion of silica in the clay which does become soluble, depends the value of the clay for cement making, for when free silica exists in certain physical conditions it seems to be readily rendered soluble in the above reagents by the action of bases like oxide of calcium and magnesium even at comparatively low temperatures.* It has been recently proved that pure silica and pure oxide of calcium can under certain conditions, be made to combine to form a perfect cement, but the state of division and temperature necessary is far beyond anything that would be practical to attempt for any purpose other than theoretical investigations. The question of grinding the raw material is of vital importance to the manufacture of cement, both in regard to the number of mills and amount of power required, and the quality of the finished product. Of course the higher the required temperature for producing a stable clinker the more coal per barrel must be burnt. Therefore, a clay the constituents of which are *naturally* in a chemical and physical condition that will permit of their uniting with lime when ground to ordinary fineness (say 95 per cent passing a No. 100 sieve) and burnt at a comparatively low temperature, is the one to be chosen. The above mentioned test shows conclusively the character of a clay with reference to its adaptability for combination with the necessary bases. It ought never to be omitted when examining clays with a view to their manufacture into cement. However, very rarely indeed will it be found that all the silica of a clay will become soluble, when thus tested; but it is safe to say that a clay in which there is an insoluble residue of more than 12 per cent, of the silica shown to be present by chemical analysis, is entirely unfit for use in the manufacture of cement.

THE FINENESS OF PORTLAND CEMENT AS AFFECTED BY THE TYPE OF GRINDING MACHINERY EMPLOYED IN GRINDING SAME.

It will often be noticed in sieving Portland cement that there exists certain definite relation between the residues obtained on the 100 and 200-mesh sieves. By 100-mesh sieve is meant a sieve having 100 openings to the lineal inch. By 200-mesh sieve is meant a sieve having 200 openings to the lineal inch. It will be noticed also that the relationship in question varies with the style of grinding machinery employed. That is, having given the residue on a 100-mesh screen we can calculate with a fair degree of accuracy what the probable residue would be on a 200-mesh screen and vice versa, provided we know the particular type of mill in which the cement was ground.

The formulæ derived and given below were obtained from the results of several hundred sievings of cement ground in ball and tube mills, and also of cement ground in Griffin mills, the observations covering the routine work of one entire year at a Portland cement plant using both types of machinery.

In what is to follow let r represent the per cent remaining as residue on a 100 sieve; R represent the per cent remaining as residue on 200 sieve.

Then for cement ground in Griffin mills.

$$r = 0.433R - 1.794.$$

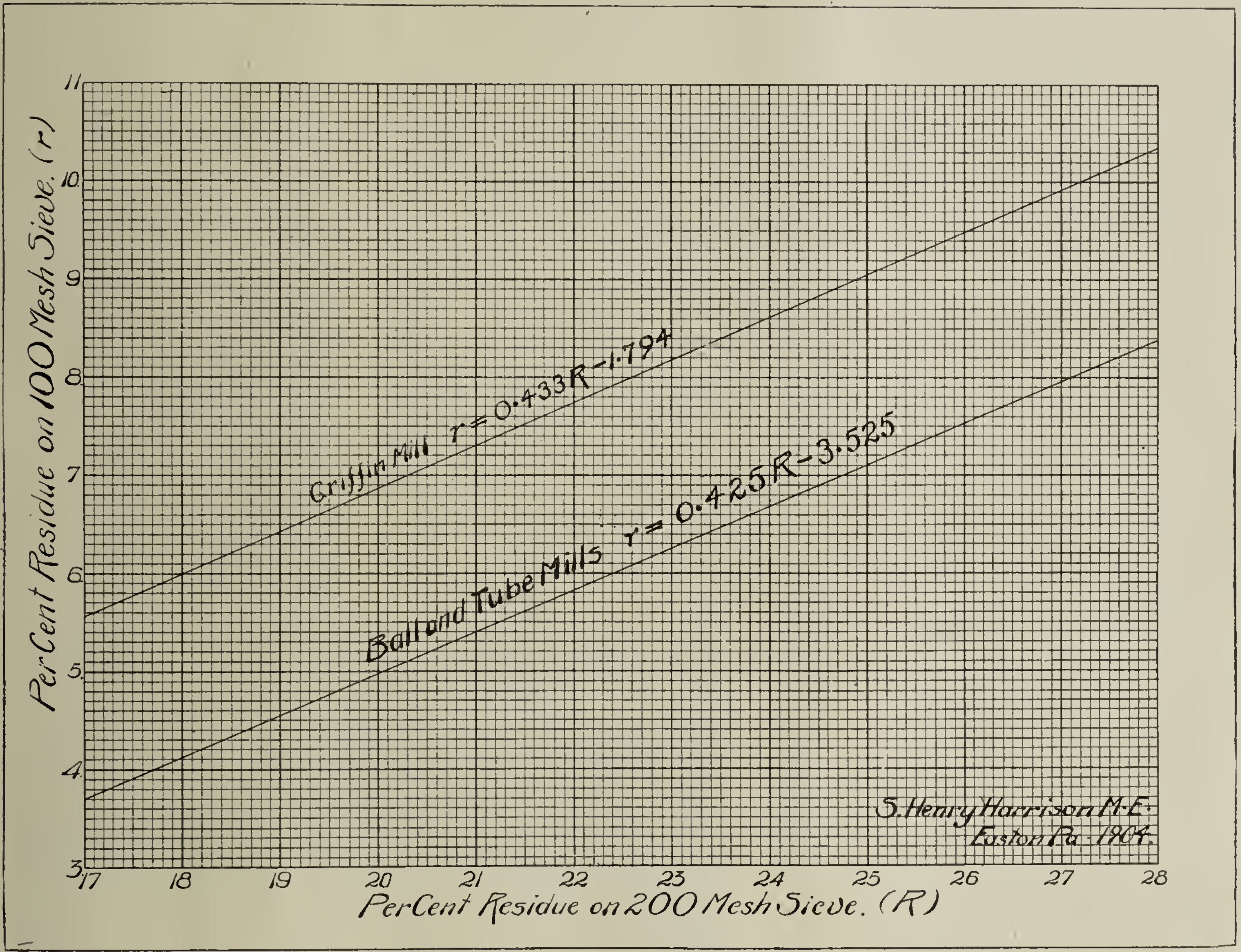
$$\text{And } R = \frac{r + 1.794}{0.433}$$

Further for cement ground in ball and tube mills.

$$r = 0.425R - 3.525.$$

$$\text{And } R = \frac{r + 3.525}{0.425}$$

Plotting these equations so that the values of r are laid off as ordinates and the values of R as abcissae, we see that the equations are represented by two almost parallel straight lines.



It is interesting to know from these curves that a cement ground in Griffin Mills and having a given residue on the 100 sieve will give a smaller residue on a 200 sieve than a cement ground in the ball and tube mills with the same residue on the 100 sieve.

The curves show at a glance the relation existing between the residues on the same sieve but ground in different style mills. The formulæ are useful in as much as they enable us, with a fair degree of accuracy, to determine the probable residue on one sieve when that on the other sieve is known. It should be carefully noted that the diagram and formulæ are useful only within the limits as shown on the diagram.

S. HENRY HARRISON.

Atlantic and Gulf Portland Cement Company of New Jersey; capital $10,000. Incorporators, Wm. E. Stokes, John D. Evans, Walford Wolcott.

THE POSSIBILITIES OF CONCRETE CONSTRUCTION FROM THE STANDPOINT OF UTILITY AND ART.

BY WILLIAM L. PRICE.

Read before the March quarterly meeting of the Association of American Portland Cement Manufacturers, held at the Bellevue-Stratford Hotel, Philadelphia, and published by that association as "Bulletin No. 2."

It is not my purpose to dwell especially upon the use of cement in the purely engineering side of building, although I believe that its use in that direction is in its infancy—and the general problem of concrete for heavy foundation work and reinforced with steel for structural work, has been covered by experts in those arts.

The accepted use of reinforced concrete as a structural material does, however, open up a field in architectural design that has been little considered. We have, both here and abroad, a comparatively large number of concrete buildings which are structurally good, but in most cases they are treated merely as a skeleton on which a building apparently of brick or stone is hung—a makeshift and a sham, whether the actual work is done by structural steel or a concrete frame developed therefrom.

But reinforced concrete used even as a skeleton offers opportunities for design not offered by any other material. A steel-frame building is no stiffer than its joints, and in buildings of greatly varying heights or loads allowance must be made in design to take up undistributed settlement, or serious cracking will result. While in concrete the building, if properly designed structurally, and properly built of proper materials, is a monolith.

In the Blenheim Hotel, at Atlantic City, we have an exaggerated case of uneven loading. The Solarium is but two stories high, it covers an extent of 150 by 120 feet, it immediately joins the main structure which leaps at the juncture to twelve stories—a height to the dome of 155 feet, and next adjoining this mass is the main building, eight stories high, surrounded by outlying sun parlors and banquet rooms of two stories. And yet, in spite of this divergence in loads and the fact that this work was not all built at one time, there is not an eighth of an inch settlement in any part of the building. A steel building on the same foundations would probably show at least three inches of settlement, and it would not be safe to count on less.

It is my opinion that a considerable area of this building could have the foundations washed out without damage to the structure, nor does the heaviest wind so far encountered cause a perceptible vibration, even of the highest part of the building. These facts are not new as facts in engineering, but as architectural facts and inspirations they have been largely ignored. But if the cement manufacturers will stand by the architects this will come. Any falling off, however, in the quality and reliable characteristics of cement will be fatal, as a concrete building is either the best or the worst of constructions, and primarily the cement is the vital point, so that the cement man's first business is with himself. But while his responsibility may end there, his interests do not. The best of cements may be improperly or dishonestly used, poor sand, poor stone, poor mixing and placing alike will damn the construction, and it is in this direction that the greatest danger lies, and this danger is an imminent one. If buildings are to be designed by incompetent or ill-informed engineers and architects, no matter how much they know of design in other directions, the result will be disastrous, both to the cement men and to those among the architects who believe in the future and possibilities of cement.

It all looks so easy, just the building of boxes and the casting of concrete and steel in the moulds, and where the law, or, better, knowledge, does not protect us, all sorts of liberties are going to be taken, owing to the desire to save materials and the large factor of safety usually and properly allowed.

To illustrate when bids were taken on the Allegheny City Station of the Pennsylvania Railroad a number of bids were received, varying considerably in amount, and, while the specifications called for 16,000 pounds stress upon the steel and 500 pounds on concrete, we found upon questioning the bidders that some of them had computed their steel as high as 22,000 pounds, and their concrete at 750 pounds. In fact, they were entirely frank about the matter, stating that there was no law in Allegheny on the subject, and that it was amply strong. Nor had they at all considered it incumbent on them to use the stone specified. Now, if this is to be the tendency of even large and reputable contractors, I can see grave dangers ahead, both from the effect of failures upon the public, and the passage of too stringent laws.

I turn from the dangers to the possibilities of the material architecturally. I cannot see much sense in the use of concrete as a substitute for block building material, although it will probably have its place if it is frankly treated as concrete and not as imitation stone. But the possibilities of design in concrete used this way are those of its competing materials, stone, brick and terra cotta, so that I shall not dwell upon that, but try to point out something of what seems to me to be its greater possibility as a plastic material.

In block building, whether of stone, brick or other material, the joints are an essential element of building, and as such should become an essential element of design to be accentuated rather than hidden, and in all characteristic and good architectural design you will find recognition of this fact. Take, for instance, any of the classic orders or their modifications in the Renaissance, and you will find a frank succession of blocks and columns set upon plinths, or directly on basement wall, cap, abacus, frieze and cornice, all built up stone upon stone with major joints marked by mouldings, bands and ornament, a logical, built structure. But if we attempt to follow such a system of design in a plastic material, or even a material like wood, the results are disastrous to true architecture. The design becomes a matter of external form, not of the true expression of methods and materials used. Concrete is built with shovel and trowel, and its proper ornamentation should be either cast in moulds as built or such as can be run or fashioned on the work, with the addition of such color ornament as may be obtained by the use of terra cotta or other protecting material used as wall copings, roofs, pier caps, etc., and such other flat color ornamentation as may be produced by the use of tiles, marble, glass or other material which is evidently applied to the surface. It is evident that this would and should make a wide departure from classic forms and accepted styles, that it means in fact a new architecture, although it will not be necessary to abandon all precedent. We shall want walls, windows and doors in any case, and must learn to build them in their accepted forms. But in a material so plastic the forms of openings and mouldings may be expected to vary much from those necessary to an architecture dependent on arches and lintels. There is more to be learned in the Spanish, or Californian and Mexican varieties of Spanish, than any other accepted type. Their plastered walls, tile roofs and wall copings suggest concrete more than they do brick, and their domes and curved pediments are already suggestive of plastic rather than block construction.

I may perhaps be permitted to refer to the Blenheim Hotel as an example of an attempt to carry out some of these thoughts. At least there is no suggestion of built structure in its simple wall openings, its exceedingly few and simple mouldings, and its total lack of cornices. We have distinctly tried in it to use a solid wall, pierced by the simplest of openings, in an effort to reduce to a minimum the chopped-up appearance common with buildings that of necessity have many windows and small unbroken wall spaces. We have attempted, even where the wall was broken still further by bay windows, to preserve this feel of wall and have used the shadows thrown upon this broken surface by balconies, to give the relief usually obtained by ornamented cornices, and with the addition of a tile roof and some beautiful color obtained with Mercer tile, we have secured sufficient color and variety to make a building essentially plain in wall surface, give a sense of richness not always obtained by the use of elaborate and expensive ornamental work in stone or terra cotta, and the use of a moderate amount of terra cotta where required for sills, copings and other wall protection, has been made usually important by modeling it in interesting and appropriate sea forms and coloring it a light green, by a glaze which has the additional advantage of destroying any semblance of stone and giving it a plastic character that seems appropriate to modeled ornament. It is along the line of simple and direct expression of the purpose and mode of construction of building that architecture grows when it is really growing, and cement in its manifold possibilities spreads before us a new field for the imaginative designer.

A NEW FOUNDRY.

Of late years the H. W. Caldwell & Son Co., Chicago, has given more than ordinary attention to the manufacture of large pulleys, band wheels, fly wheels, sheaves, gears and other heavy castings. This branch of their business was given increased impetus when the Caldwell Company, something more than four years ago, acquired the patterns, preparations, molding machines and other appliances for the manufacture of the well-known Walker Machine - Molded Gears and other heavy power-transmission machinery formerly made by the Walker Manufacturing Company of Cleveland, Ohio. The trade in this line of work, together with their general requirements in the way of castings, has grown so steadily that the Caldwell Company has been compelled during the past year to add to their plant the large new foundry shown by the accompanying illustration.

Caldwell Foundry.

The foundry building is 115 feet wide and 184 feet long. On the ground floor is the center or main bay 50 feet wide the full length of the building and containing a water-tight circular pit 50 feet in diameter and 10 feet deep. This is used for molding fly wheels, band wheels and general heavy work. Along either side of this bay is a narrow-guage track separating it from a 32-foot side bay served by small electric cranes. Over the main bay is a 20-ton electric traveling crane capable of 50 per cent overload and having an auxiliary 5-ton hoist. Above the west side bay is the charging and storage floor, having a weight-sustaining capacity of 750 tons. Over the east side bay is a 32-foot wide gallery, full length of the building, used for snap-flask and bench molding. The gallery and the charging floor have the usual narrow-guage tracks and trucks, and material is taken to and from these floors by electric elevators. The average melting capacity of the present cupola is 12 to 14 tons per hour. Arrangements have also been made for another and larger cupola.

This new foundry has not only added to the Caldwell Company's line larger and heavier work than has hitherto been possible, but has enabled them to give their customers a service more prompt and satisfactory in all lines.

The installation, some time ago, of a Niles boring and turning mill capable of finishing castings as large as 20-foot diameter and 8-foot face also enables the H. W. Caldwell & Son Co. to furnish heavy castings finished as well as in the rough.

Engineer and Architect—W. L. Stebbings, Chicago.

Electrical Engineer, Charles G. Atkins, Chicago.

Electric Elevators—J. W. Reedy Elevator Company, Chicago.

Electric Traveling Crane—Pawling & Harnischfeger, Milwaukee, Wis.

Blowers—P. H. & F. M. Root Co., Connersville, Ind.

Cupola, Ladles, Etc. — Whiting Fdy. Equipment Co., Harvey, Ill.

Heating Apparatus—Buffalo Forge Co., Buffalo, N. Y.

NEW YORK LETTER.

The business outlook for cement and concrete interests is all that could be desired, so far as orders are concerned. Cement manufacturers are disposed to growl a little at cement prices, holding that profits are too small, while on the other hand consumers who are called on to pay $1.61 per barrel, the latest quotation for good American Portland, say they are giving all it is worth.

Not in years has so many building operations, large and small, engrossed the attention of engineers, architects and contractors, and concrete blocks and reinforced concrete is in constantly increasing demand.

Almost without exception a number of large engineering firms seen by your correspondent said they were very busy with plans in hand or active construction work going on and added that the outlook is for one of the most active construction seasons in the history of New York.

Said Mr. H. Logan, with F. L. Schmidt & Co., cement mill machinery, etc.: "We are very busy in all departments, but especially so in our machinery department, filling and delivering orders. In fact our machinery output is entirely taken up until next August." The company has closed a contract to furnish tube mills for the Southern Portland Cement Co., a new concern which is building a mill at Leeds, Alabama, and which will have a capacity of between 400 and 500 barrels of cement per day.

The number of firms entering the concrete and concrete block and allied manufacturing interests is so large as to be noticeable. Among the more prominent of such firms of the past month are: Ætna Brick Co., of Brooklyn, which will make concrete blocks. J. H. Goldberg, 554 48th street, is interested. Art Concrete and Construction Co., of Evergreen, N. Y. This company will give special attention to manufacturing artistic facings. Paul Stier, of Evergreen, N. Y., is at the head of the company. At Rochester, N. Y., Geo. A. Cooley and others have formed the Rochester Concrete Building Material Co. and will manufacture blocks and tiles. The Cement Post and Pile Co., of Orangeburg, N. Y., is capitalized at $200,000. William H. Coe, 32 Broadway, this city, is interested. Whiting G. Berten, of Montclair, N. J., is at the head of the Reinforcement Supply Co., of New York, which will deal mostly in supplies for reinforcing concrete construction. The Granite Block Mfg.

Co., of Plainfield, N. J., will manufacture artificial stone, concrete blocks and other material. Frank M. Brown, of Plainfield, N. J., is at the head of the company. Thomas J. Byrne, 903 Cauldwell avenue (the Bronx), is interested in the Universal Cement Block and Brick Co., which will make concrete bricks and blocks. The Newark (N. J.) Concrete Building Block Co., 156 Frelinghusen avenue, is capitalized at $125,000 and will, it is stated, manufacture concrete blocks, etc., on an extensive scale. Harvey E. Dodge, 35 Halsey street, Newark, N. J., is interested. N. Schneider's Sons' Contracting and Construction Co., a reorganization of an established firm, Brooklyn, will make a specialty of constructing cement sidewalks, curbs, etc. The New Jersey Cement Construction Co., 221 13th avenue, Newark, N. J., will undertake concrete construction work. The Porcelantic Steel Tile Co., of New York, will, in addition to manufacturing steel tiles, also manufacture imitation marble. Wm. Hopper heads a company of Dumont, N. J., known as the Dumont Cement Block Mfg. Co., and will manufacture concrete blocks on an extensive scale. David Carpenter, 156 5th avenue, New York, is one of the interested incorporators of the Knickerbocker Concrete Brick Co., capitalized at $750,000, organized to manufacture concrete brick, blocks, etc. The Haverstraw Trap Rock Co., Haverstraw, N. Y., will quarry and crush stone, and the Silica Sand and Supply Co., 111 Broadway, are two new companies, closely identified with cement and concrete interests.

Local capitalists hold considerable stock of the Detroit and Ætna Portland Cement Co., which has a mill at Fenton, Mich. The past month Rene E. Paine, of Boston, filed a mortgage foreclosure of $400,000 against the company.

The Hayden Automatic Block Machinery Co., 26 Cortland street, has furnished concrete block and mixing machinery the past month to the firms noted: Alexander Graham, Ottawa, Canada. He has been awarded a contract for a large government building, to be of concrete block construction. Amityville Cement, Concrete and Architectural Building Co., Amityville, Long Island. The Peerless Granite Co., Weehawken, N. J. A. S. Bedell, Flatbush, Brooklyn. N. A. Fuller, of the Dumont Cement Block Mfg. Co., New Milford, N. J. Art Concrete and Construction Co., Evergreen, Long Island. Ernest Simons Mfg. Co., South Norwalk, Conn. Bridgeport (Conn.) Real Estate and Investment Co. This firm bought a block machine, mixer, gasoline engine and large equipment. F. W. Marshall, Cohoes, N. Y. Pasquale Carupella, Ozone Park, Long Island. Referring to trade conditions, Mr. Hayden said: "There is such a demand for good concrete building blocks of guaranteed mixture that most of the concrete block manufacturing companies are very busy. One firm we sold to has an order for 30,000 blocks. The business outlook for concrete block manufacturers is certainly most encouraging." The block machines, mixers, etc., sold by the Hayden company, are all manufactured at the large plant of the P. Hayden Saddlery Hardware Co., at Columbus, O.

R. B. Lawrence, 39 Cortland street, formerly selling agent for the Haines concrete mixer, is now selling several makes of mixers and is also interested in Black's stone breaker.

Warren Bros., who have offices here and in Boston, control patents on certain kinds of sidewalks. They are anxious to have New York and other municipalities use said sidewalks, and in the legislature the past month Assemblyman Agnew introduced a bill permitting New York City to amend its charter to the end that the Warren sidewalk could be used. Objection to the plan is that the introduction of a patent pavement would stifle competition and create a monopoly.

President Woodward of the National Machine Tool Builders' Association is arranging for the annual convention of the association. It will be held at Atlantic City, probably convening about April 16. A large number of cement and concrete tool manufacturers are identified with the association and at the annual conventions always manage to learn much that is new as well as have a good social time.

J. F. Havemyer, president of the recently organized Concrete Steel Co., said of business: "We are very busy on plans in hand and the business outlook is encouraging." The company is erecting a large hospital at Cincinnati of reinforced concrete construction. Mr. H. C. Miller, chief engineer of the company, designed the 200,000-gallon water tank at Bordentown, N. J.

While actual sales of Portland cement were a little slow in the earlier part of February, due partly to weather conditions, March inaugurated a change for the better, and at present writing cement manufacturers report a good demand. Prices are firm, with an upward tendency. Quotations, wholesale, are: Rosendale, or natural, in wood, per bbl., 95c; German Portland, per bbl., $1.90@2.10; American, Portland, $1.50@1.60; ditto, in bags, $1.20@1.30.

Local cement circles have been notified of serious frauds being perpetrated in the cement industry of Belgium. It is asserted natural cements are mixed with artificial Portland cement, reducing the quality of the Portland and rendering it really dangerous to use in many lines of construction. Of course, the "adulterated" cement is sold at "cheaper" prices, and this fact has put reputable builders on their guard.

Your correspondent's attention has been directed by a local importer of German cements to a statement in a German paper to the effect that the German government has an immense laboratory where cements and other building materials are thoroughly tested. All material found reliable, etc., are thus given governmental approval and naturally find a more ready sale. Commenting on the plan, the local cement man said: "I wish the United States government operated a similar laboratory, for I believe it would result in much good. Cement manufacturers, of course, now conduct their own tests, and we have some good professional men and chemists who prosecute testing work. But governmental approval of cements, sand, lime, and other materials would do a great deal to establish general confidence in building materials."

The identical cements tested at the German government laboratory never finds its way into the markets because it is either worked up into test pieces or the quantity is so small as to be of no commercial value.

The Cement Product and Construction Co. is a new $50,000 Boston enterprise, in which Helen C. Evans, 27 School street, is interested.

A large delegation of local cement manufacturers attended the first quarterly conference of the Association of American Portland Cement Manufacturers, at Philadelphia, the past month. They speak highly of the papers read, and were well pleased with the proceedings generally.

KNICKERBOCKER.

PHILADELPHIA LETTER.

Cement manufacturers and dealers report large orders, firm prices and fair collections. Local wholesale prices (at tidewater) on cements are: Rosendale, or natural, in wood, per bbl., 95c; American, Portland, per bbl., $1.50@1.60; ditto, in bags, $1.20@1.30; German, Portland, barrels only, $1.90@2.10. The tendency of prices is upwards, and next month is almost certain to see an advance of 10 cents a barrel.

That cement and concrete material will be in brisk demand the coming season is shown by the building outlook, which never before has been so encouraging and bright. Reports from Reading, Lancaster, Atlantic City, N. J., Pottstown, Shippensburg, Allentown and other nearby cities show that these places also anticipate a regular "boom" in building, and as contracts prove, a remarkable amount of cement, concrete, reinforced concrete, etc., construction is called for. The settlement of several labor contentions gives promise of industrial peace. The one dark cloud is the apparent certainty of a strike in the anthracite coal regions of Pennsylvania. The feeling of uneasiness in manufacturing circles here is plainly apparent, and if the strike really comes, no doubt some large building operations will be held back or suspended. But if claims that plenty of coal is stored prove true, construction work will go on as usual.

Of the heavy concrete work in-sight, or under construction, the following is worthy of mention. A large concrete dam at McCall's Ferry, on the Susquehanna River, to furnish water power to generate 10,000 H. P. electrical energy to supply Baltimore and Philadelphia with current. The project is being financed by Boston capitalists, estimated to cost over $10,000,000. The work will consume three years. The dam will be of concrete, nearly 4,000 feet long, an ogee curve, like the letter S, reversed and elongated, from 30 to 50 feet high, 80 feet wide at the base and 16 feet at the top. The coffer dam method of construction will be used, concrete being deposited in the timber forms and tamped solid. A concrete mixing plant has been erected near the dam site, having a capacity of 3,000 cubic yards of concrete every ten hours. One hundred and fifty carloads of stone, sand and cement will be consumed daily, it is stated. The dam will create a lake 6 miles long and from 30 to 50 feet deep. Over 1,000 men are now at work and ultimately 2,000 or more will be employed, if they can be secured, for labor is really scarce. A power plant will be installed to generate 10,000 H. P. Duplex and possibly triplex turbines, on a vertical shaft, will be installed to drive electrical generators. The project is meeting with opposition from the State Fishery Department, which claims the dam will ruin shad and other fishing interests, but it seems that under state law the Fisheries Department has little or no power to prevent the building of the dam.

The John W. Allison Co., which makes a specialty of reinforced concrete construction, has a large number of small building contracts on hand, and among the larger ones are the construction of reinforced concrete roofs and floors for a new $24,000 tenement house; reinforced concrete flooring, etc., for the branch Carnegie public library on Spring Garden street.

The Drehmann Paving Co. will erect a glue factory for Tunnell & Co., 43 by 104 feet, of reinforced concrete construction.

Marriott Bros., large coal dealers, will have a coal storage and handling plant built on Washington avenue. The edifice will be 48 by 65 feet, 50 feet high, and hold about 2,000 tons of coal. To be of reinforced concrete.

Martin Stiller, for C. J. Mathews & Co. (kid leather manufacturers), will erect a reinforced concrete smokestack, 106 feet high, to cost $1,350. This will be the first stack of reinforced concrete to be erected in Philadelphia, and manufacturers in various industries say they will watch the "outcome" with interest. The smokestack being successful, it is safe to say that, on account of cheaper cost and better efficiency, there will be many a new concrete smokestack go up in the future in the Quaker City and vicinity.

Cyrus H. K. Curtis, of the "Ladies' Home Journal" Co., will erect a $500,000 building at 6th and Walnut street. It will be ten stories high, the interior to be of reinforced concrete.

Morse, Williams & Co., elevator manufacturers, are having an addition built to a smithshop. It is 63 by 73 feet, of brick and reinforced concrete.

The Standard Sanitary Mfg. Co., known as the Plumbers' Supply Co., has purchased 12 acres of land (for $40,000) at Camden, N. J., and will erect a manufacturing plant at a cost of $500,000. Reinforced concrete construction will be extensively employed.

The Unit Concrete Steel Frame Co., which, as the name implies, makes a specialty of reinforced concrete work, has a large number of contracts in hand, and the office force is very busy. The past month the company took out a permit to put in reinforced concrete floors in the large H. T. Paiste Co.'s (electric specialties) plant, 32d and Arch streets.

If the city of Philadelphia grants the right to the Philadelphia & Western Railroad (supposed to be the Wabash Railroad under another name) to enter the heart of the city via an elevated structure from 63d street to the Schuylkill River and thence via subway beneath Chestnut street, there will be virtually millions of cubic feet of concrete used. It is probable the city will grant a franchise as merchants and people are clamoring for the road. If permitted to build, as noted, the Philadelphia & Western will become an active competitor of the Philadelphia Rapid Transit Co., which has a subway completed and in use from the Schuylkill River to 15th street and which will go on building an extension of over a mile to the Delaware River. Here it may connect with the company which intends to tunnel the Delaware River and connect with an electric railroad to Atlantic City—the "City-by-the-Sea." In completing its market street extension the Philadelphia Rapid Transit Co. will use thousands of yards of concrete. Large quantities of concrete are booked to be used in regular railroad extension work, improvements, bridges, culverts, etc.

With such a vast amount of cement and concrete work booked for future consummation, it is small wonder that local machinery, tool and supply houses find trade quite lively. Without going too much into detail it can be stated that the Philadelphia office of the McKelvey Concrete Machinery Co. has sold and is putting out hand and power concrete mixers at a most satisfactory rate. Naturally the Link-Belt Engineering Co., whose conveying machinery is widely used in cement mills and auxiliary industries, is busy on orders for immediate and early spring delivery. The company's Trump mixing and weighing machine is having steady sales. The Webster Mfg. Co.'s local office finds trade very satisfactory. The Contractors' Tool Co. and John Stortz & Sons, manufacturers of cement, concrete, etc., tools, are also unusually busy on good orders. The outlook for a "good season" is bright.

The General Paving and Construction Co., of this city, will secure a state charter. It will construct concrete edifices as well as do a general line of building. Two auxiliary to concrete companies chartered the past month were the Atlantic Gravel & Supply Co., Atlantic City, N. J., and the Eastern Sand Co., 317 Market street, Camden, N. J.

John G. Snyder, of Altoona, Pa., Wm. M. Davis, New York City, and Geo. M. Osgoodby, of Montclair, N. J., are back of the American Railway Steel Tie Co., chartered under New Jersey law the past month; capitalized at $1,000,000, to manufacture steel ties.

H. W. Latta lectured before the Philadelphia Engineers' Club, March 17, on "The New Sea Wall at the Naval Academy." The huge concrete structure at Annapolis, Md., offered the lecturer a splendid chance to deliver an interesting and instructive paper.

Mrs. Mary M. Rehrig, who, after her husband's death, successfully managed the business of the Coplay Cement Works, died at Allentown, Pa. the past month, aged 77. In 1900 she sold the Coplay interests to New York capitalists for $2,500,000.

John W. Henderson, head of the firm of Henderson & Co., Limited, contractors, died at his home at Wynnecote, of diabetes, the past month. His firm has been an extensive user of concrete in construction work. Charged with fraud in connection with municipal work, Mr. Henderson's health was deeply affected.

Wm. F. Frazier, a well-known concrete curb and pavement contractor of Camden, N. J., was stricken with paralysis the past month.

WM. PENN.

PHILADELPHIA LETTER.

The first quarterly conference of the American Portland Cement Manufacturers' Association for 1906 was held at the Bellevue-Stratford Hotel, Philadelphia, March 12-14. The first day's proceedings were virtually a conference of the Executive Committee, of which Robt. W. Lesley is chairman. The regular sessions opened March 13. There was a good attendance of cement manufacturers from all parts of the country. The main feature of the sessions was the reading of technical and trade papers and discussions thereon.

Frank B. Gilbreth gave a stereopticon talk on the making and driving of corrugated concrete piles, the talk being greatly enlivened with many views of this form of construction—a method growing more and more in favor in the East.

William L. Price read a paper describing the Hotel Blenheim, at Atlantic City, constructed almost entirely of reinforced concrete. Kahn system. It is on the Spanish style, ornamented with tiles. Henry C. Mercer supplemented Mr. Price's paper by discussing the artistic treatment of the concrete in the Hotel Blenheim. Prospective builders are, of course, influenced more or less by the beauty or ugliness of completed structures, and in the Atlantic City hostelry one finds true artistic treatment in concrete construction, pleasing to the eye and decidedly practical and serviceable. Sanford E. Thompson read a valuable paper on different varieties of sand for mortar and concrete.

The association decided the papers were so valuable and interesting that it was decided to have them printed. While the papers referred to were the chief topics discussed, an "under-current" subject received considerable attention, viz., the advisability of adopting a uniform price for the various grades of cement.

Several cement manufacturers say they do not intend going into any rigid price agreement, first, because it conflicts with the United States anti-trust laws; second, because it would tend to kill honest competition.

The association took no action on prices—merely discussed the advisability of having them "uniform."

The social feature of the conference was a fine supper, served amid informal social converse, etc.

Harbison-Walker Sales.

The Harrison-Walker Refractories Company of Pittsburg, Pa., manufacturers of highest grade fire clay, silica, chrome, magnesite brick, importers and shippers of grain magnesite, magnesite cement, chrome ore, etc., reports that during the past two months they were in receipt of the following interesting orders and contracts.

Bethlehem Steel Company, South Bethlehem, Pa.—Orders for all refractory materials required for new Open Heart furnace construction and two new blast furnaces, eight new stoves, connections, etc.

Milliken Brothers, Mariner's Harbor, Staten Island, N. Y.—Entire requirements of refractory material for five new basic Open Hearth furnaces, soaking pits, heating furnaces, gas producers, etc.

New York State Steel Company, Buffalo, N. Y.—Entire requirements of refractory materials for two 200-ton "Talbot" furnaces with accompanying soaking pits, gas producers, boiler settings, etc.

Colonial Iron Company, Riddlesburg, Pa.—Complete blast furnace lining.

Dunbar Furnace Company, Dunbar, Pa.—Complete furnace lining and all brick required for one new stove.

Central Iron & Steel Company, Harrisburg, Pa.—Complete lining for blast furnace.

Colorado Fuel & Iron Company, Pueblo, Colo.—All brick required for blast furnace lining.

Marietta Glass Company, Indianapolis, Ind.—One of the largest orders for glass furnace construction ever placed.

H. C. Frick Coke Company.—All brick required for 264 Bee Hive ovens.

Republic Iron & Steel Company.—All brick required for 100 Bee Hive ovens.

Washington Coal & Coke Company.—One million brick.

Copper Queen Mining Company, Dawson, N. M.—Four hundred thousand brick for coke ovens.

Hostetter Connellsville Coal & Coke Company.—Five thousand brick.

National Cement Company.—Eastern New Jersey.—All brick required for lengthening 16 kilns, etc.

Regular trade customers are ordering in larger quantities than ever before and new customers for refractory material are constantly coming forward.

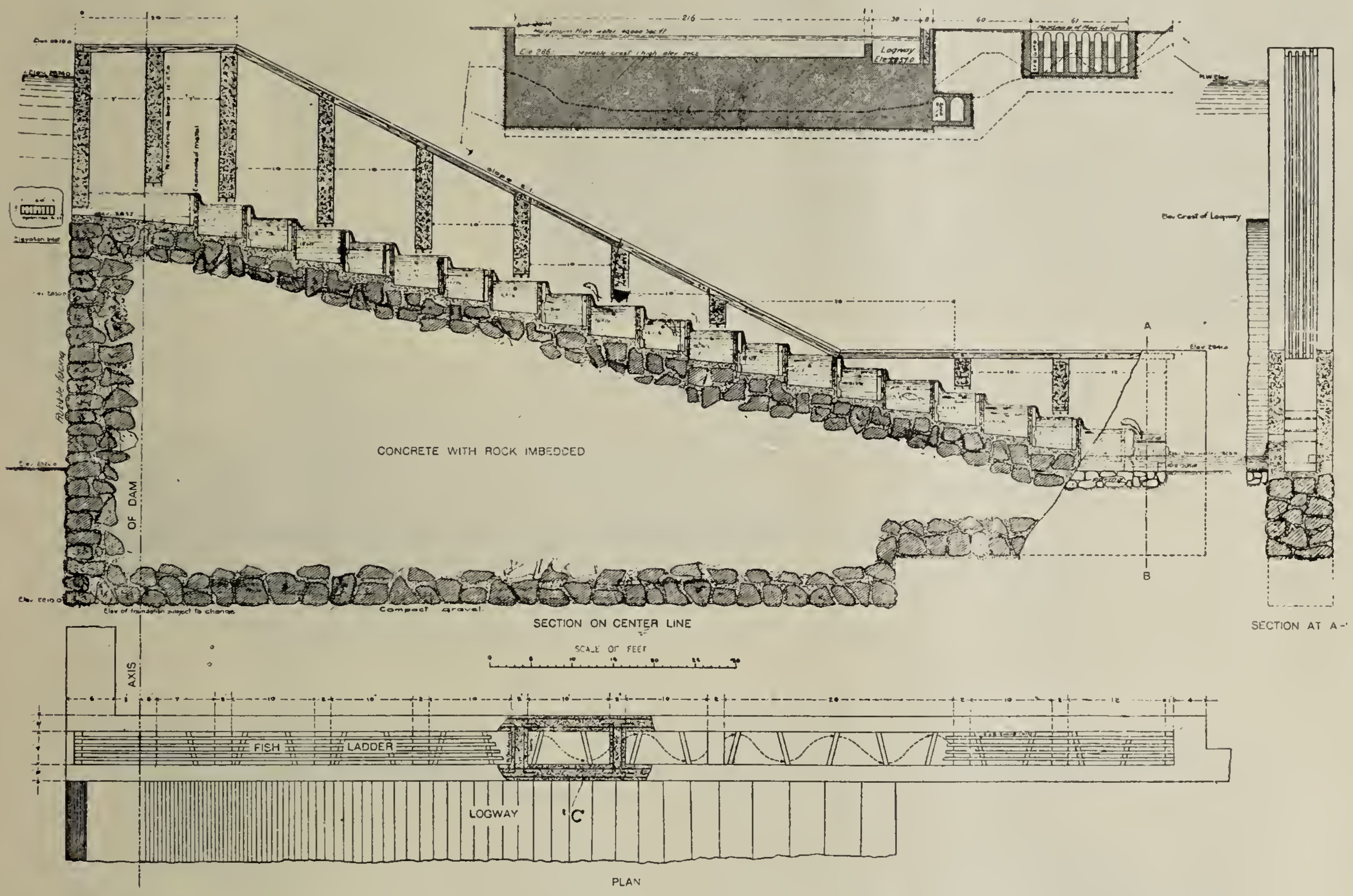
The high pressure at which industrial establishments are being operated shows no signs of abatement; in fact, the insistent demand is increasing month by month, as shown by the fact that the orders received in February are 25 per cent larger in tonnage than those received in January, and nearly double the tonnage in September, 1905. February orders were the largest ever received in the history of the Refractories Company during the past four years, and those received to date, in March, are in excess of those received for a corresponding period in February.

The Union Portland Cement Co. of Utah has filed corporation papers. Head office, Ogden, Utah. Capital, $2,500,000, of which 10,000 shares are preferred and 15,000 common stock. Par value $100 per share, 7 per cent annually being guaranteed upon the preferred stock. There are 103 incorporators, subscriptions to date being $500,300 to the preferred stock, each subscriber for preferred stock to receive double the amount of subscribed in common stock. The plant will be erected near Morgan, Morgan County, Utah, just southeast of Ogden on the Union Pacific Railway. The following are officers of the company: President, C. W. Nibley; vice-presidents, Joseph Scowcroft, M. S. Browning and Reed Smoot; secretary and treasurer, James Pingree. And they with C. E. Murphy, Carl Leonardt, J. W. Abbott, Aman Moore, B. G. Blackman, James Mack, Angus T. Wright, D. A. Smyth, Charles Ziemer and Adam Patterson, form the board of directors.

The railway employes of Germany are being furnished with free hot coffee while on duty with the view of securing greater safety. The experiment has been attended with gratifying results, the consumption of alcoholic drinks has been greatly reduced, while the efficiency of the men has been increased. There were fewer accidents to employes, as they have better command of their faculties and perform their duties more cheerfully.

REINFORCED CONCRETE FISH LADDER.

The United States Government reclamation service for arid lands has let contracts for the construction of irrigation works known as the Payette Boise Project, Idaho, which will consist of a dam, main canal, earth embankments, etc. The dam will be located some miles above the city of Boise on the Boise river. A fish ladder constructed of reinforced concrete will be carried over the fall of the dam from the down-stream side of the dam over the crest. The masonry of the dam will be the rock imbedded concrete 258 feet long, divided by three openings. The first, 216 feet wide with a movable crest; second, the logway, 30 feet wide; third, the fish ladder, 4 feet opening, all as shown in figs. 1, 2 and 3. The fish ladder rises in a series of 20 basins, each 6 feet long by 4 feet wide, except the upper basin, which is 14 feet long and confined between 2-foot reinforced concrete walls, as shown at C in the plan, fig 3. The reinforcement consists of expanded metal imbedded on the inner or outer faces of the wall as well as the cross walls in the end walls of the basins. The rise of the 20 steps from the river level to the crest of the dam will be about 30 feet, or about 18 inches rise between each step or basin, over which the fish will be compelled to leap in making the ascent to the water empounded by the dam. The top of the walls enclosing the fish ladder is covered by rails 4 by 8 inches cross section, extending the entire length of the ladder to guard against limbs and branches falling into the basins which would obstruct the passage of the fish up or down the ladder. About 27,000 cubic yards of concrete will be used in the work. The United States Government has $31,000,000 available for reclaiming lands. Something over $7,000,000 has been expended on this class of work during the past few years.



CROSS SECTION OF DAM AND HEADWORKS SECTION AND PLAN OF FISH LADDER.

A cement famine exists on the Pacific coast, especially in Oregon and Washington. At Portland cement is scarce at $3 per barrel, the imported brands having been displaced by the products of the California cement mills in the past few years. Little foreign cement is now in stock or even in transit for the coast, the dealers having relied almost exclusively on the California mills, the inducement being 50 cents per barrel in favor of the product of the California mills under normal conditions, while present prices are nearly 100 per cent higher.

The Atlantic Portland Cement Company, of Easton, Pa., capital stock $100,000, was granted a charter on March 5th by the State Department at Harrisburg. The incorporators are H. D. Maxwell, president; R. A. Hamilton, treasurer, and F. P. McCloskey, all of Easton.

The purpose, it is understood, is to purchase the properties of the Alsten Pennsylvania Portland Cement Company in Lower Nazareth, Palmer and Bushkill townships, Northampton county. This identical property was reported to have been purchased by a California syndicate represented by Dr. Irving A. Bochman, of Napa Junction, Cal.

The Nazareth Portland Cement Co. will enlarge its plant. Foundations for the extension are under way.

THE KAHN SYSTEM REINFORCED CONCRETE.

The Trussed Concrete Steel Co. of Detroit, operating under the Kahn System Reinforced Concrete, has 24 sub-agencies, of which one is in China, one in England and one in Cuba, to superintend its extensive field of operation. The system is based upon the use of trussed bars in two forms, the regular type and the staggered trussed bar, the last being shown in Fig. 1, which is rolled in one piece of medium open hearth steel, which is to be preferred over high carbon steel from a strictly engineering standpoint, especially for live loads where the high carbon will snap or break short without bending. The mild steel will simply bend and give way gradually. The trussed bar has been indorsed by the leading engineers of this country and Europe. In this connection we quote from Chas. F. Marsh, author of "Reinforced Concrete," who says:

"I am personally convinced that there is a distinct advantage in the rigid attachment of the shearing to the main longitudinal reinforcements and that the forming of the two in one piece is an excellent way of attaining this object and also that employment of the surplus longitudinal reinforcement at the ends of a beam for supplying the shearing reinforcement is distinctly economical."

The best system may fail if it is not carefully executed under competent engineering supervision. In this respect the Trussed Concrete Steel Company has acquired a reputation for doing strictly first-class work in every instance. Having built up a reputation it cannot afford to undermine its good name by slipshod methods of construction. Our illustration is of several reinforced constructions executed under the Kahn System, Fig. 2 being a factory building erected for Ferd Dickerman at Cincinnati, O.; Fig. 3, reinforced concrete stairway, Maryland Casualty Building, Baltimore; Fig. 4, Lake Park bridge, Milwaukee, Wis., Newton Engineering Co., engineers; Fig. 5, railroad trestle for the Lehigh Coal & Navigation Co. at Lansford, Pa.

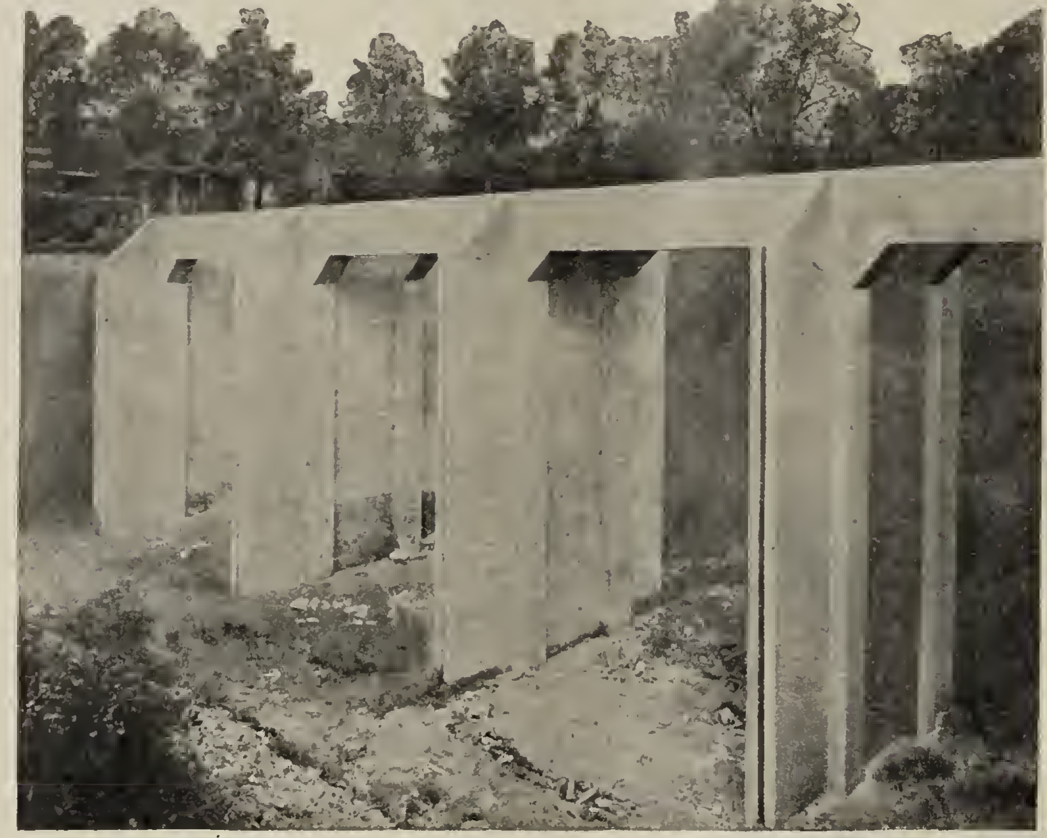


Fig. 5.

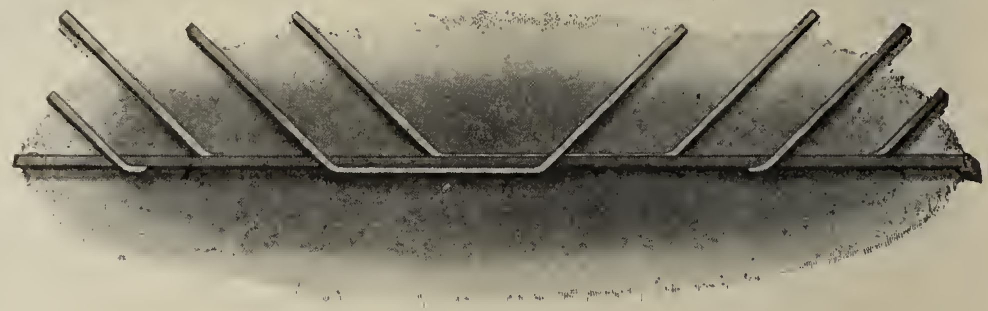


Fig. 1.

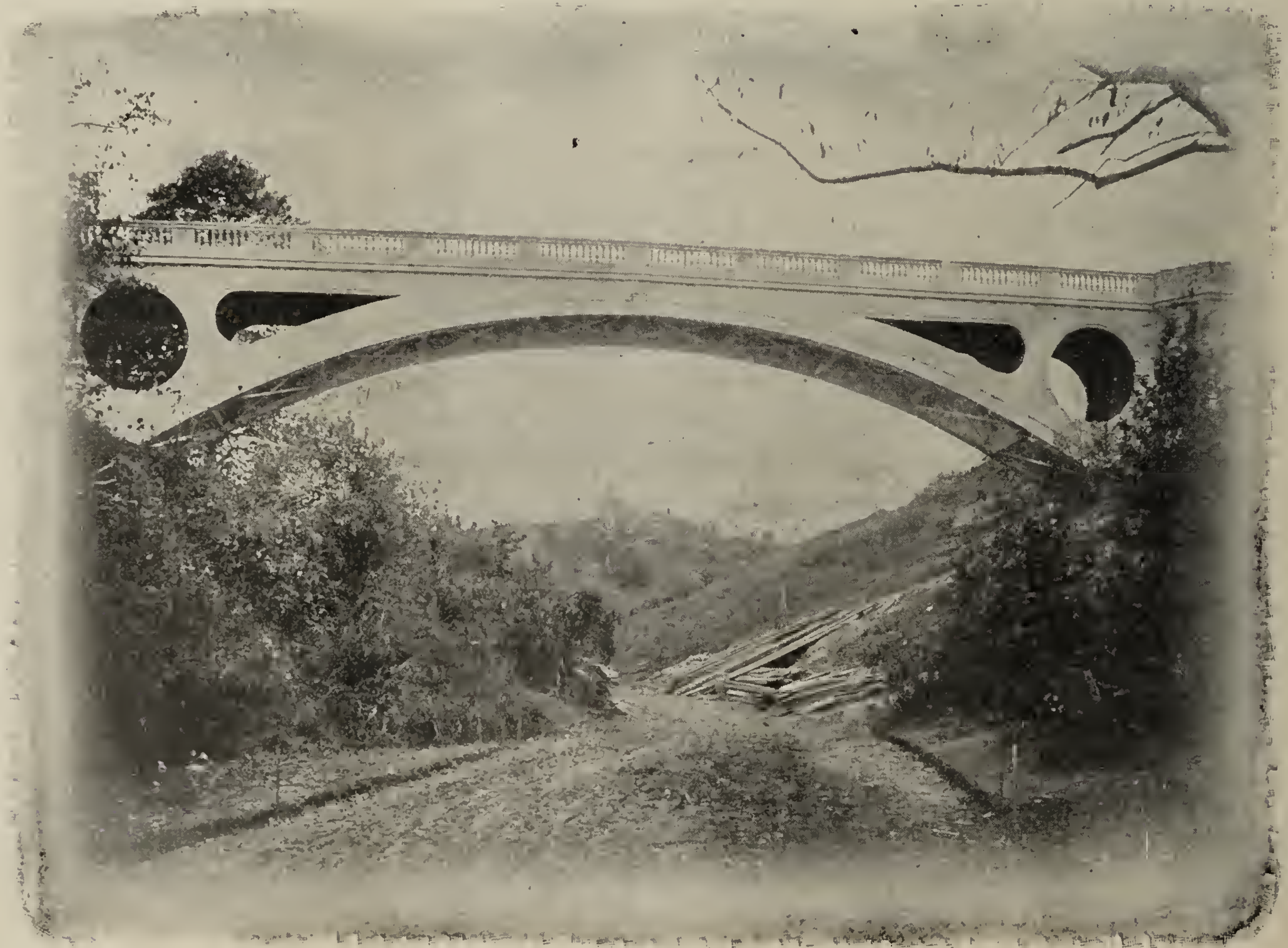


Fig. 3.

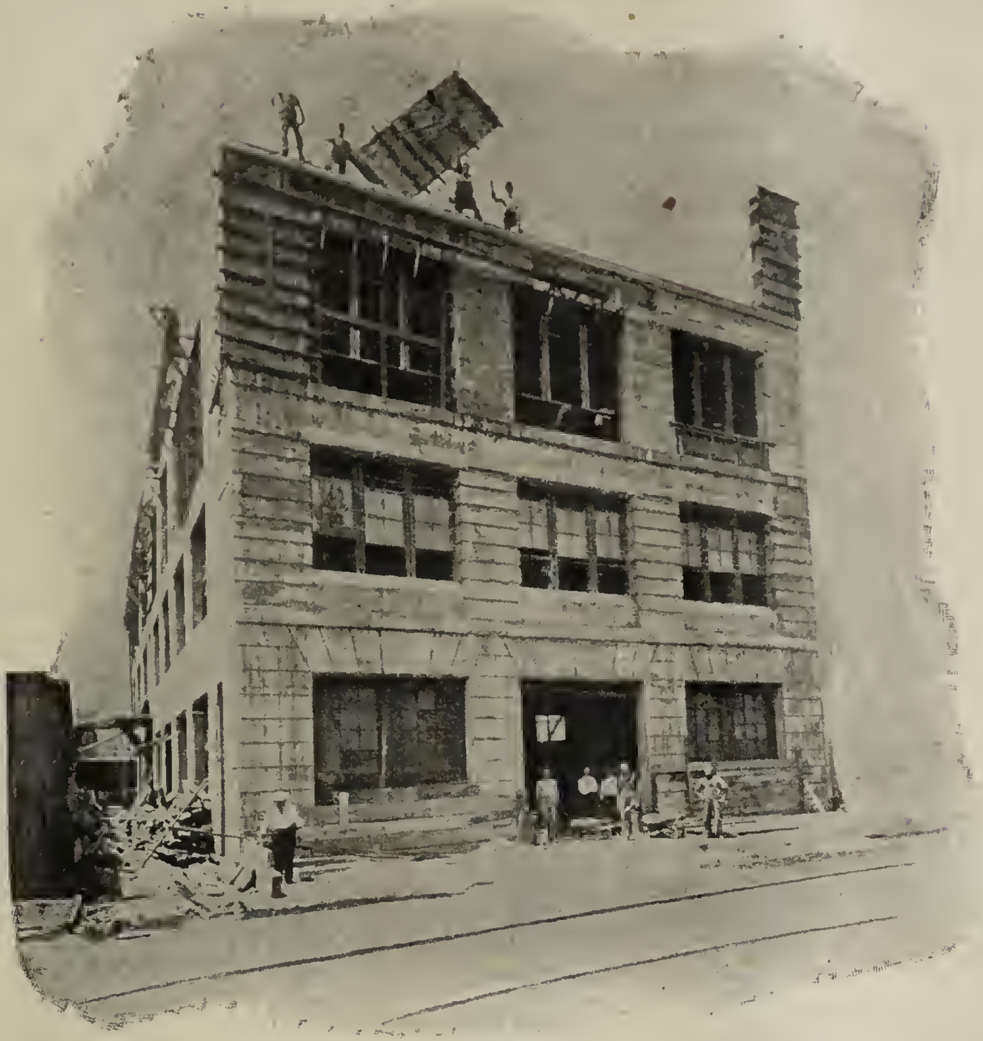


Fig. 2.

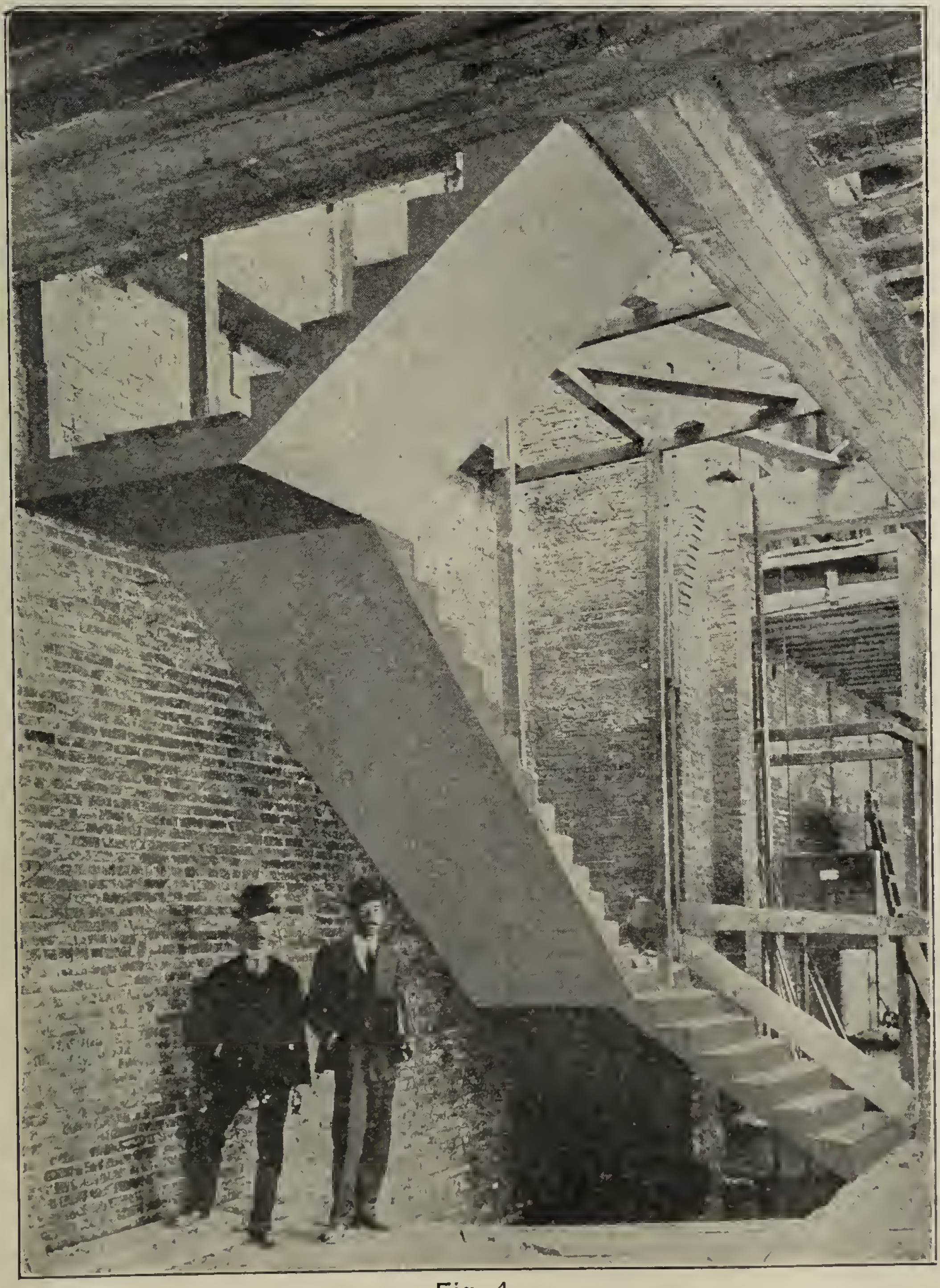


Fig. 4.

Kuhn System Remfould Concrete.

CEMENT AND HYDRAULIC LIMES MANUFACTURE, PROPERTIES AND USE.

BY E. CANDELOT.

TRANSLATED BY M. GASKELL KNECHTEL.

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Samples for analysis should be carefully taken from many different places on the face of the cutting.[1]

The rock is either mined or blasted. Thousands of tons are thrown down at a single blast, the larger pieces being broken up by sledges; the different layers are then mixed to make the product more regular and uniform in composition.

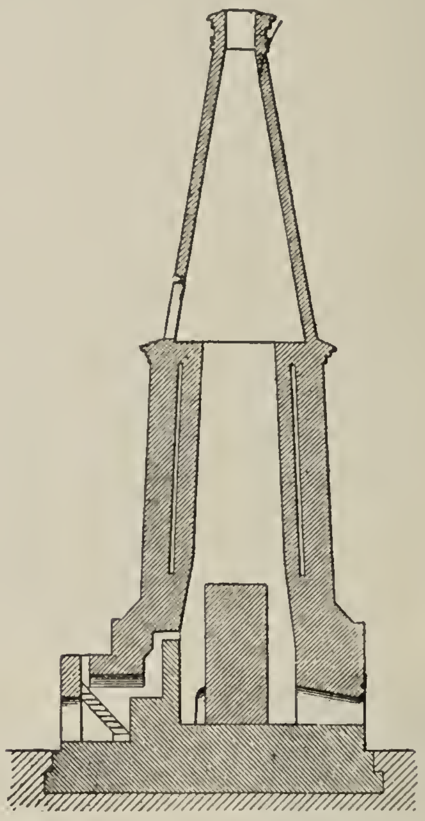


Fig. 1—Fahnehjelm Kiln.

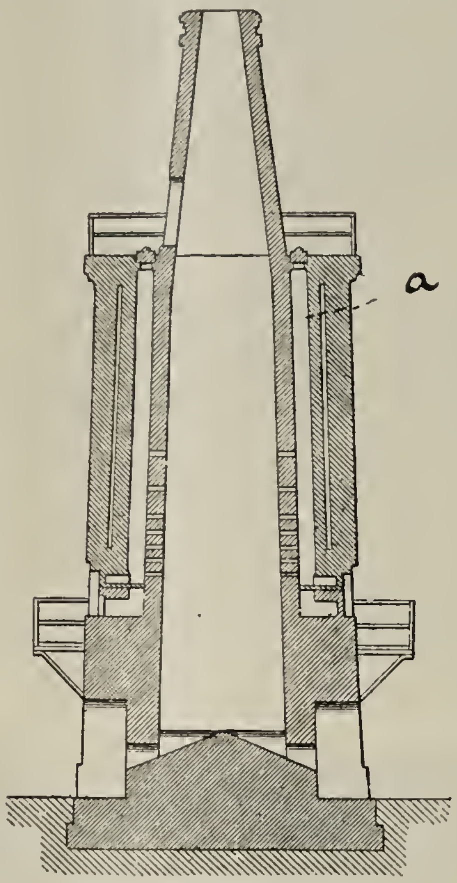


Fig. 2—Paar Kiln.

Where the location of the land will permit the kilns are built with the mouth or intake on a level with the quarry in order to reduce the expense of handling the rock.

In the erection of a large lime works it is necessary to provide facilities for the economic handling of the heavy raw materials. M. Bonnami's treatise on hydraulic limes gives plans for such a plant, operated on the gravity system, in which the rock descends into the mouth of the kiln, and after calcination is discharged into slaking bins and next to the grinding mills; from thence to the packing house, and is finally received at the stock house. Such a plant can only be erected where the natural lay of the land is favorable.

Burning.—In the burning of hydraulic lime various kinds of kilns are used. These may be classified into long flame and short flame kilns. In the long flame kilns the furnace is placed outside of the kiln proper. Figures 1, 2 and 3 illustrate long flame German kilns in which gas generators are used.

The Fahnehjelm kiln (Fig. 1) is cylindrical and is 12 meters high (about 39 1-3 feet), surmounted by a dome chimney. The stone is generally charged into the kilns through an opening in the dome. The gas generators are located outside and at the base of the kiln. The gas enters the combustion chambers through a series of ducts; the admission of air for combustion enters the kiln through the adjustable openings around its base from which the burned hydraulic lime is drawn, passing through the incandescent burnt lime, it becomes very hot before it reaches the combustion zone.

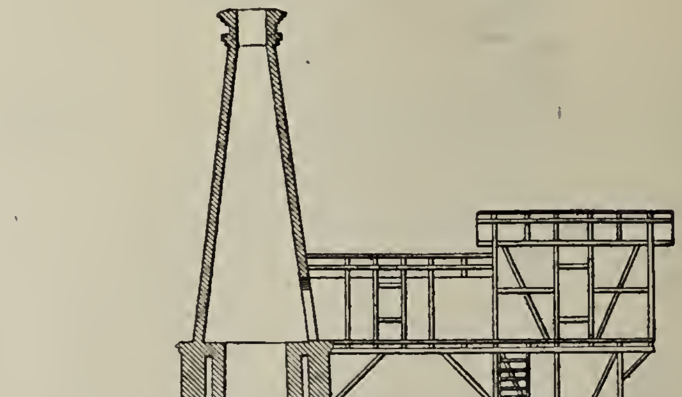


Fig. 3—Rüdersdorf Kiln.

The drawing of the lime takes place every two hours.

One advantage of this kiln is that a cheap quality of fuel can be used; the burning of 100 pounds of lime requires from 22 to 30 pounds of slack coal, the output varying with the size of the kiln from 11 to 33 tons per 24 hours.

Paar kiln (Fig. 2) is much like the preceding. The fuel is introduced at the top of the kiln into a series of shafts, "a," built into the walls of the kiln. The gases enter the kiln through openings, connecting the fuel shafts, "A," with the interior of the kiln. The working of this kiln is similar to the preceding one, the dimensions and output being about the same.

The Rüdersdorf kiln (Fig. 3) differs from the other two in that the gas generators are replaced by grates upon which soft, bituminous coal is burnt, producing the long flame. In using slack coal, inclined instead of horizontal grates must be used. This kiln has a capacity of from 5½ to 14 tons per 24 hours. The kiln is usually 32½ feet high and consumes from 24½ to 35 pounds slack coal per 100 pounds hydraulic lime burned.

The short flame kilns give better results than the long flame and are therefore more generally used, because of greater fuel economy as well as uniformity of burning.

These kilns are oval in form and vary in height from 22 ft. 9 in. to 26 ft.; others are from 40 to 42 ft. high. At Tiel the most modern kilns are 42 ft. high. The diameter of the kiln mouth varies from 3 ft. 3 in. to 4 ft. 10 in., the diameter at the bush being from 11 ft. 4 in. to 13 ft. and from 4 ft. 10 in. to 6 ft. 6 in. at the base (Fig. 4).

The loading capacity of the kiln is about 100 cubic yards, with a daily output of about 20 tons.

The fuel employed for burning is generally anthracite. In some kilns a ton of lime uses 130 to 140 kg., being 280 and 308 pounds, of coal; in others as much as 150 to 160 kg. are used.

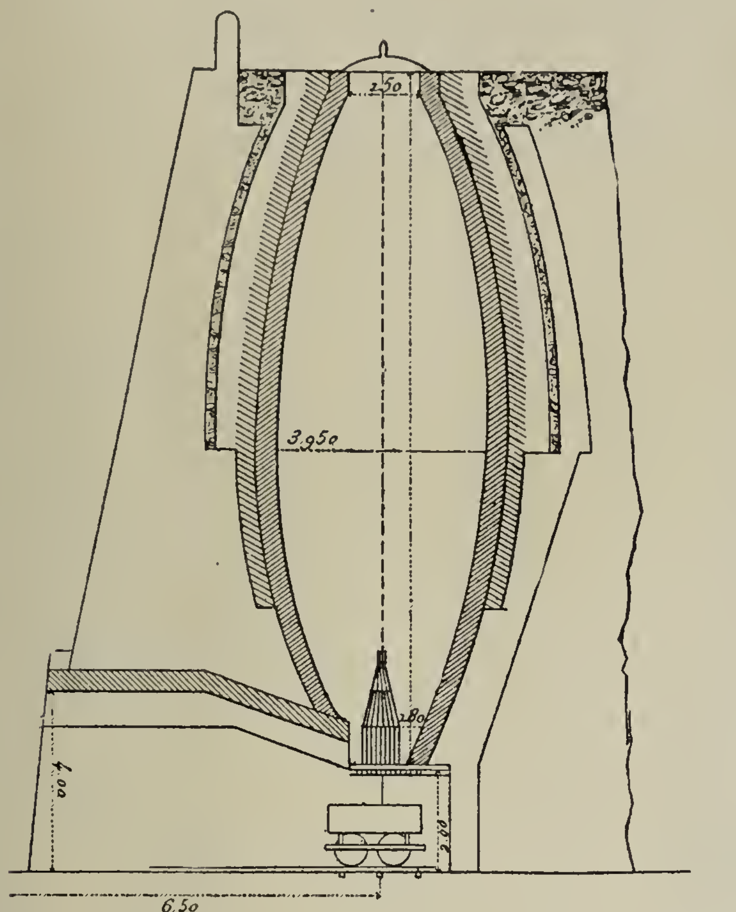


Fig. 4—Teil Kiln.

The top opening of the kiln is provided with a lid, which allows the kiln to be loaded regularly. The lowest opening is closed by a grate of movable bars, which is placed high enough to allow the burnt lime to fall into the wagonets. In other kilns the lime falls into receivers situated in each wall of the kiln and closed by trapdoors below which wagonets are placed. (Kilns of Malain, Fig. 5.)

As may be seen in Figs. 4, 5 and 6, the kilns in general use are somewhat alike; they only vary a little in their dimensions. A Marans of the "Works of M. Nivet" has invented some kilns of a particular form (Fig. 7). These kilns are only 26 feet in height and are narrower at the top of the kiln than at the grate, at which section it is hoppered. Their diameter in the largest part is 8 ft. 9 in.

The kiln is charged with alternate layers of coke and limestone; when it is full, it is lighted on the grate; as soon as the mass has settled sufficiently to receive a new charge a certain quantity of burnt lime is drawn and the recharging continues so that the kiln is thus kept full.

The stone remains in the kiln from two to four days. The greater part of the lime is drawn during the day; at night very little is drawn, sometimes none.

The skill of the burner consists in being able to draw the lime in such a way that the zone of burning maintains itself at a convenient height and the amount of fuel is so regulated that the limestone is properly burned.

The regularity of the burning depends upon the care taken to prevent disturbances produced by exterior agencies such as winds, rain, etc., and also upon the kind of limestone. The latter has a marked influence on the success of the kilns. The burning should be strong enough to cause the complete reaction between the silica and alumina and the lime, at the same time there must be enough of free lime to cause rapid slaking.

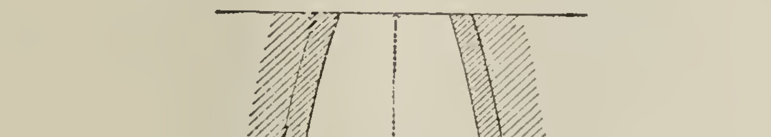


Fig. 5—Malain Kiln.

When the lime has a higher index, the burning may be stronger because there will be plenty of free lime; and when the index approaches the lime limit, a strong and prolonged burning would diminish the quantity of free lime and this being imprisoned in a vitreous mass would be hard to slake. With such rock the burning should be less intense but more rapid.

With very irregular limestone it is difficult to obtain a good product, as some portions are too hard burnt and some not enough. To burn limestone of a low index properly would be to vitrify the limestone with a high index, and on the contrary if the latter is properly burnt, that which contains the smaller amount of clay will be under-burnt.

The Dietzsch and the Schoffer kilns (Fig. 8) are also used. These are described in the chapter on the manufacture of cements. The Schoffer kiln or the Aalborg has been modified for lime burning, in that it has been reduced in height and diameter, but the working is the same. The production of these kilns varies between 16 and 22 tons every 24 hours and the quantity of fuel employed is only from 100 to 120 kg—220 to 264 pounds—per ton of burnt lime.

8—Schofer Kiln.

A. Passage for drawing out the burnt material.

B. Opening for putting in the limestones.

D. The zone of burning.

E. Chimney.

F. Passages for introducing the fuel into the kiln.

HYDRATED LIME MANUFACTURE.

Slaking—In the manufacture of

hydraulic lime the slaking is the most important operation because the quality of the product depends largely on this. Manufacturers as a rule have not been careful enough about the slaking and this has been the cause of much of the failure that has taken place in lime manufacture.

In certain works the lime is watered at the moment it is drawn from the kilns, then loaded on the wagons and carried into sheds where it is put in heaps. In other works better planned the lime is received into the wagons at the outlet of the kilns and immediately conveyed to the slaking chambers. There it is exposed either on the ground or on a movable platform in a layer 4 or 6 inches in depth and is sprinkled by means of a jet of water falling over it like rain until the whole mass has been well dampened. Care must be taken not to add too much water nor must it be thrown on hastily, as the result would likely be a drowned lime slaking with great difficulty and containing a large quantity of inert particles. The quantity of water used amounts to 15 or 20 per cent of the weight of the burnt lime, but only 7 or 8 per cent is retained.

When sufficient water is added, in fine sprays so that every particle of lime has been well dampened, the slaking commences at once. It liberates a great quantity of vapor, the larger pieces burst in expanding, so little by little the lime is reduced to a fine powder. When the lime is spread upon the ground in the slaking chambers it is immediately put in heaps or if it has been placed upon a movable platform it is carried and thrown into trenches. In all cases it is important not to allow the lime to become cool at the moment of slaking; on the contrary it is necessary to profit by using the heat developed during the slaking to maintain as high a temperature as possible in the mass. For this reason the heaps ought to be very large, because the heat can be more easily maintained.

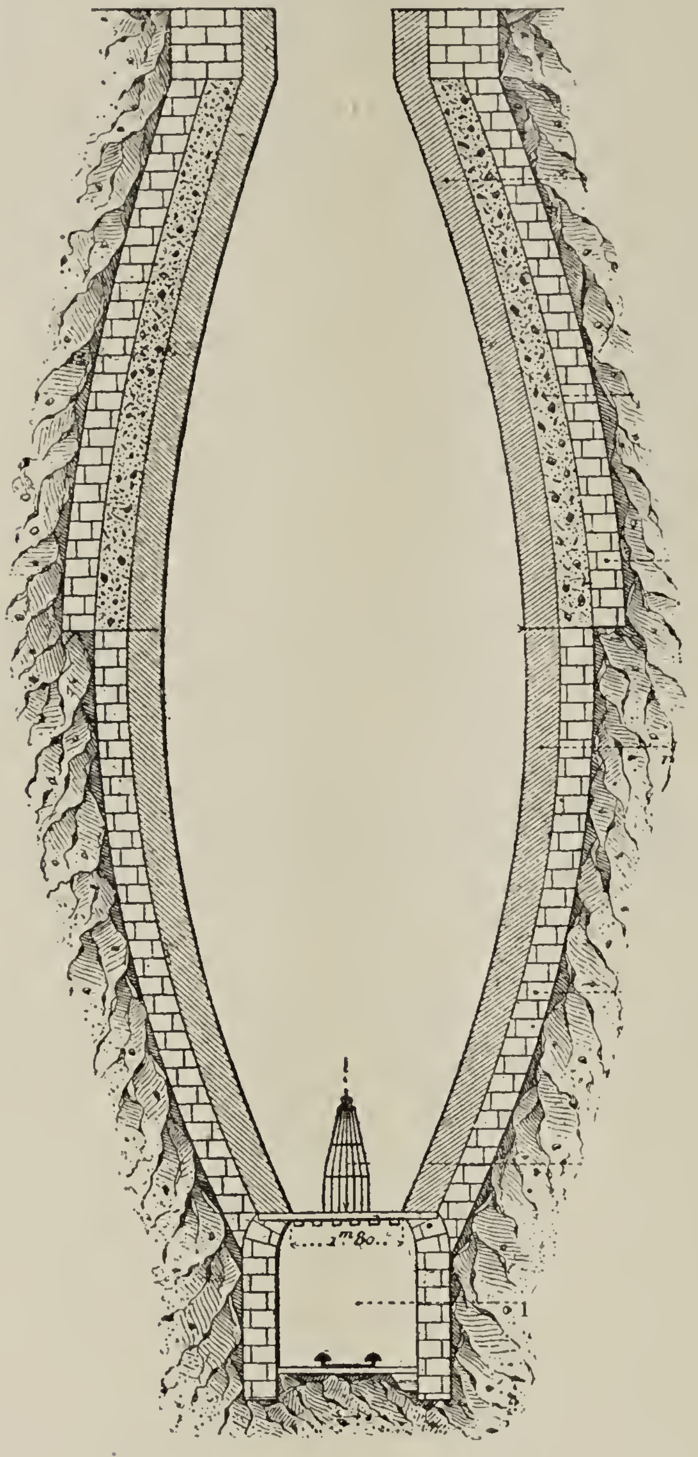


Fig. 6—Louvières Kiln.

Feeble hydraulic limes are reduced to powder in a short time, while lime with a high index slakes in 10, 15 or even 20 days.

Formerly lime was delivered fresh from the kilns and was slaked after it reached the dealer. This method has gradually disappeared and now the lime is slaked and ground before being shipped, giving better results in every way. A lime imperfectly slaked and coarsely ground is very dangerous if used too soon after its manufacture. The particles that have not slaked slowly hydrate and after the mortar has attained some degree of hardness the swelling produced by the hydration of the unslaked parts is enough to break up the masonry.

M. Le Chatilier has investigated this question and we give here some of the results of his researches.

"In slaking lime there are four distinct phases.

(1) The lump lime is spread in thin layers before being gathered into heaps and sprinkled with water. The water is absorbed by the stones through capillary action, but it does not cause either chemical action or slaking excepting in under-burnt stones or deficient in silica during the short time the stones remain spread. The quantity of water used ought to be about one and one-half times that which ought to remain in combination, say about 15 to 20 per cent of the weight of the lime according to its nature. This excess is necessary because of the loss in evaporation which is brought about by the heating of the mass. There must not be too great an excess because the silicate of lime in absorbing part of this water loses the property of hardening and in evaporation the lime is likely to become too cold, thus preventing the complete slaking of the lime. The drowned limes being insufficiently slaked and not being distrusted are doubly dangerous to the employer.

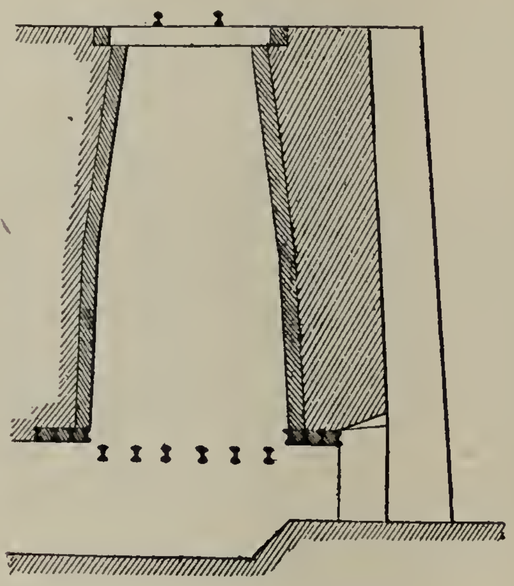


Fig. 7—Marans Kilns.

(2) The lime as soon as it is wet is lifted with a shovel upon the surface of the heap, which ought to still be hot enough on the face to raise the temperature of the newly added layer; under the influence of this rise of temperature the hydration of the live lime commences and a new quan-

tity of heat is disengaged. This phase, however, not brought about by the complete slaking because the heat set free by the first portion of water that has combined caused at once an increase of temperature sufficient to cause evaporation and the driving off of the water not yet combined. A part of this water enters the atmosphere, therefore is completely lost, and part penetrates into the heaps, where it helps to carry on the slaking. In order to obtain the rapid slaking of the front of the heap, its face will have to be guarded to keep up a proper temperature. To do this the width of the heaps should be in proportion to the production of the works. This width must be such that the chilling of the lime by the side walls will not be so great as to lower the mean temperature of the mass. As good hydraulic lime cannot be made if one operates on too small a scale, the width of the heaps in well-planned works is never below 9 feet 9 inches.

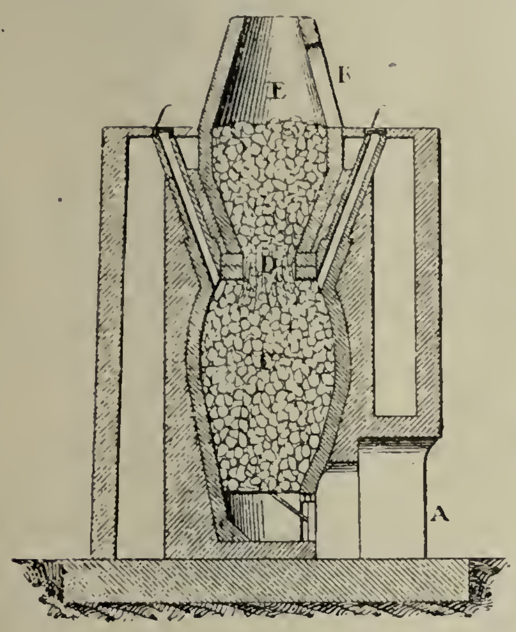


Fig. 8.

(3) After the first period of rapid slaking the lime still holds an excess of free lime, so more water must be added to complete the slaking. This water should be furnished in a state of vapor by the new quantities of material added to the heap, but the slaking is still very incomplete, for if the lime contains sufficient silica and is well burnt, there remains free lime more or less completely imprisoned by the excess of silicates. At the same time the decreasing of the temperature of the material slaking itself allows a certain quantity of water to attack the silicates.

(4) In the fourth stage the lime in the interior of the heap receives vapor from the new material commencing to slake. It is not able to receive moisture from the atmosphere because that can only penetrate to the bottom of the thick heap of pulverized material which is only slightly permeable, but at the same time the slaking of the live lime continues progressively. This slaking under these conditions is carried on at the expense of the water absorbed by the silicate and aluminate of lime. These give up little by little their water to a body that absorbs it with avidity in a very simple manner.

We know that the formation and decomposition of hydrates is at each stage in temperature limited by a certain tension determined by the moisture. For the hydrate if lime this tension limit of disassociation of efflorescence is at an atmosphere of 842 degrees F.; for silicate of lime it is 302 degrees F. It decreases with the temperature, following the same law as that which deals with the tension of vapor. It then follows that at the ordinary temperature the tension for the hydrate of lime will only be equal to the minutest fraction of a millimeter of mercury, while for the silicate of lime it will reach several millimeters of mercury. At 212 degrees F. it has not reached a millimeter for the first of these but several centimeters for the second. As a result the pulverized mass enclosing the hydrated silicate of lime has an atmosphere confined in the voids enclosing a tension of the vapor of water equal to that of dissociation of the hydrate. This vapor would hydrate steadily the live lime remaining and in proportion to its absorption would be replaced by a new quantity given up by the silicate, the decomposition of which only stops after the re-establishment of the proper tension of efflorescence. This continual exchange of water between the silicate and the live lime would increase in rapidity in proportion to a rise in temperature. Of one part because chemical action goes on much more rapidly with a rising temperature; of the other part because of the tension of efflorescence of the silicate increasing rapidly with the temperature.

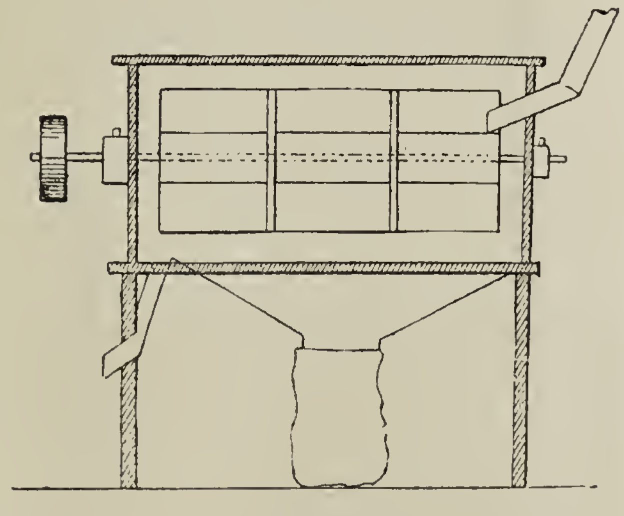


Fig. 9.

Laboratory experiments show that the results of slaking lime under these conditions would require some months and at 212 degrees F. ten days or more. The experiments at factories show that slaking of lime of good quality ought to continue about eight days and then the lime should remain on the heaps for about five days and it will then be in good condition.

This indispensable prolongation of the slaking is neglected in a great number of works and it is the principal reason, if not the only one, for the inferior quality of most of the hydraulic lime. In many works the slaking is stopped at the end of forty-eight hours, and the resulting product leaves much to be desired. In reality there can be only two alternatives; if the lime is of a good chemical composition and well burnt, its slaking is then certainly incomplete and it will crumble when being used. If the slaking is really complete in 48 hours, the lime is either under-burnt or does not contain enough silica, so it would not be sufficiently hydraulic nor would it harden as well as good hydraulic lime. Extra care in the slaking greatly improves the manufacture of hydraulic limes without increasing the price to any marked degree.

Bolting—The lime on being reduced to powder is carried to the bolters, where all that is sufficiently pulverized is gathered together and all pieces of any distinct size that are either overburnt or under-burnt and have not been slaked must be rejected. In order to do this the lime is made to pass a gridle with bars about one inch apart. This allows the finer portions to fall through, while the larger pieces, either overburnt or underburnt, are retained. The bolters are made in sections and shaped like polygons, revolving on an axis slightly inclined; the surface is covered with a wire cloth No. 40 or No. 50—that is to say, 220 or 324 mesh per square centimeter. The bolters make from 60 to 80 turns per minute. The material to be sifted is carried to the elevated end and is thrown on to the cloth by a rotary movement. The fine portions pass through the sieve and the larger portions pass to the lower end of the bolter, where they are received in sacks or carried back by a screw or by some other method. The lime which has passed through the wire cloth is received into a hopper ending in an opening on which a sack is fixed to be filled (Fig. 9).

(To be continued.)

Patrick Higgins has brought suit against the Peninsular Portland Cement Co. for $15,000 damages for personal injury received while in the discharge of his duties under the personal directions of his foreman.

The Castalia Portland Cement Co. has started up for the season's run, having been closed since January 1st. Mr. Charles Johnson, manager of the plant, looks for a good market and prices.

PORTLAND CEMENT SPECIFICATIONS PREPARED BY THE U. S. GEOLOGICAL SURVEY RECLAMATION SERVICE, FOR THE BELLE FOURCHE PROJECT, S. DAKOTA.

17. *Definition.*—The cement must be a high grade Portland cement. By the term Portland cement is meant the finely pulverized product resulting from the calcination to incipient fusion of an intimate mixture of properly proportioned argillaceous and calcareous materials, and to which no addition greater than 3 per cent has been made subsequent to calcination.

18. *Composition.* — The cement must be of normal composition for the brand supplied. It must not contain more than 1.75 per cent of sulphuric anhydride (SO_3), nor more than 4 per cent of magnesia (MgO). Its freedom from uncombined lime will be determined by the test for soundness as given in Paragraph 27. The question of adulteration may be determined either by chemical analyses or by inspection of the process at the factory.

19. *Weight per barrel or sack.*—The average weight per barrel must be not less than 376 pounds net and that per sack not less than 94 pounds net. If the weight, as determined by test weighings, is found to be below 376 pounds per barrel, the contractor will be required to supply, free of cost to the United States, an additional amount of cement equal to the shortage. If the cement is delivered in sacks, the empty sacks will be returned to the contractor's agent at the railroad station most convenient to the construction work. On final settlement 10 cents will be paid the contractor for each sack not returned in serviceable condition.

20. *Barrels—Damaged cement.*—If the cement is delivered in barrels, the barrels must be strong and lined with paper. The cement must be free from lumps, and any package that is broken or that contains damaged cement may be rejected by the engineer.

21. *Sampling.*—Samples of cement will be taken from individual packages in such manner as to secure fair average samples of each package sampled. Where the results of tests indicate unusual variations from the normal characteristics of the cement, this will be considered good cause for rejection. The engineer may, at his option, permit samples to be taken from cement in bulk in bins, under such rules, regulations, and conditions as he may impose; the cement in bins afterwards being held until the results of tests determine the quality of the cement sampled.

22. *Shipment.*—In all cases the contractor shall be responsible for the delivery of the cement in good condition at the place of consignment.

23. *Factory inspection.*—The engineer shall at all times have liberty to inspect the materials, process of manufacture, and daily laboratory records of analyses and tests at the cement works.

24. *Specific gravity.*—The specific gravity of the cement, thoroughly dried at 100 degrees Centigrade, shall be not less than 3.10.

25. *Fineness.*—The cement must not leave a residue of more than 8 millimeters per cent by weight on the standard No. 100 sieve of brass wire 0.0045 inch in diameter and having 10,000 meshes per square inch; and a residue of not more than 25 per cent on the standard No. 200 sieve of brass wire 0.0024 inch in diameter and having 40,000 meshes per square inch.

26. *Time of setting.*—The cement when made into paste of normal consistency, must develop initial set in not less than thirty minutes and must acquire final set in not less than one nor in more than ten hours. The paste will be considered of normal consistency when the cylinder of the Vicat needle penetrates to a point in the mass 10 millimeters (0.39 inch) below the top of the ring, the ring having been filled exactly to the top. The cement will be considered to have acquired initial set when the Vicat needle ceases to pass a point 5 millimeters (0.20 inch) above the surface of the glass on which the paste rests, and it will be considered to have acquired final set the moment that the needle does not sink visibly into the mass. The Vicat needle referred to in these specifications is that described in the Progress Report of the Committee on Uniform Methods of Testing Cement of the American Society of Civil Engineers, January 20, 1904.

27. *Soundness.*—Pats of neat cement paste will be made, of normal consistency, as described in Paragraph 26, and molded on glass plates. They will be about 3 inches in diameter, one-half inch thick at the center, tapering to a thin edge, and will be kept in moist air for a period of twenty-four hours.

(*a.*) A pat will then be kept in air at normal temperature and observed at intervals for at least 28 days.

(*b.*) Another pat will be kept in water maintained as near 70 degrees Fahrenheit as practicable and observed at intervals for at least 28 days.

(*c.*) A third pat will be put into water the temperature of which is to be raised to the boiling point and kept at that point for six hours.

These pats, to pass satisfactorily the requirements, must remain firm and hard and show no signs of distortion, checking, cracking, or disintegrating.

28. *Making briquets.*—In making briquets, neat cement paste of normal consistency, as described in Paragraph 26, will be used. The paste will be thoroughly mixed with a trowel and kneaded into the molds with the thumbs, a blunt stick, or a plunger. In making sand briquets about one-half as much water as is used for neat briquets will be used and the proportions will be one part by weight of cement to three parts of standard sand, as described in the Progress Report of the Committee on Uniform Methods of Testing Cement of the American Society of Civil Engineers, January 20, 1904.

29. *Tensile strength.*—The neat briquets, prepared as specified above, shall stand a minimum tensile strain per square inch as follows:

	Pounds.
For one day in air and six days in water	450
For one day in air and twenty-seven days in water	550

The sand-mortar briquets, prepared as specified above, shall stand a minimum tensile strain per square inch as follows:

	Pounds.
After one day in air and six days in water	150
After one day in air and twenty-seven days in water	225

30. *Requirements.*—The above are to be considered the minimum requirements. The neat tests are to be considered of less value than those of sand and cement. The average of the twenty-eight-day neat briquet tests must always be at least 15 per cent higher than the seven-day tests. A cement will be rejected which fails to meet any of the above requirements.

31. *Laboratory practice.* — The methods followed in the laboratory will in general conform to those recommended by the Committee on Uniform Methods of Testing Cement of the American Society of Civil Engineers, in its Progress Report, January 20, 1904.

Portland Cement in New Zealand, a contemporary, publishes the following under the head of "Trade Notes:"

"The traditional New Zealander may see concrete in his own land, for a recent advertisement for tenders for harbor work in New Zealand calls for construction in reinforced concrete of a part of the Queenstown street wharf and jetty."

The fact is that the New Zealand government adopted reinforced concrete construction for harbor works several years ago, several fine reinforced concrete piers and docks having been finished in the past. Portland cement has been manufactured in New Zealand for many years, several rotary kilns being in use.

News from the Plants.

The Egyptian Cement Company of Michigan is to resume.

The Alma Cement Co. has removed its general offices from Philadelphia to Wellston.

The Iola Portland Cement stock has advanced four points since the first of the year.

The Alma Cement Company will erect a new plant at Oreton, Ohio, to cost $1,000,000.

The Standard Portland Cement Co. of Charleston, S. C., will make Leeds, Ala., headquarters.

Mr. Glenn Knickerbocker has been appointed chief chemist of the Bronson Portland Cement Company.

The Speeds Portland Cement Works, near Sellersburg, Ind., has started up with forty employes.

Eastern parties have purchased lands near Owingsville, Ky., for $12,000, upon which a Portland cement is to be erected.

The bursting of a fly-wheel at the Indian Portland Cement Co. at Neodesha, Kan., will shut down the plant until early in April.

The citizens of Leeds, Ala., celebrated by holding a barbecue in honor of the prospective cement plant to be erected in that town.

Edward Mathews employed at the U. S. Portland Cement Works at Bedford, Ind., was smothered under several tons of cement.

There is a prospect of a second Portland cement plant at Table Mound, Crane Station, Montgomery Co., Kansas, near Independence.

W. F. Cowhan has identified himself with the promoters of the Iowa Portland Cement Co., to be erected at Mason City, Iowa. Mr. Cowhan has buttered his bread in several like enterprises in which he has left a record behind him.

The Atlas Portland Cement Company is storing coal at its Hannibal plant at the rate of 40 cars per day, in anticipation of the coal miners' strike. The tracks are run over the coal dump and is raised as the height of the coal pile increases.

The Lehigh Portland Cement Co. is reported to have purchased the New Castle Portland Cement Works at New Castle, Pa.

The Hecla Portland Cement Co. has men at work overhauling its plant with the view of opening up the mill as soon as possible.

Emilio Dellifore was awarded $3,500 damages against the Empire Portland Cement Co. in whose plant he had his leg crushed.

J. F. Waite was totally burned by the spontaneous combustion of powdered coal at The Portland Cement Works at Portland, Colo.

Mr. C. F. Berger, for several years in charge of the Chicago sales office of the Atlas Portland Cement Co., has severed his connection with the company.

The Newark Lime & Cement Co. of Newark, N. J., has increased its land areas by 22 acres, which will be improved to enlarge the company's plant.

The Balfour-Guthrie Portland Cement plant, under construction three miles west of Kendall, Whatcom county, Washington. Machinery is being received at the mill site.

The Art Portland Cement Company is to locate at Kimmel, Ind. The citizens of that town have subscribed $16,000 to be given to the company for locating at Kimmel.

The Dixon, Ill., cement project is in abeyance on account of the increased price of land necessary to carry out the project. Farmers owning land having doubled the price of their holdings, which the projectors refuse to pay.

The California Portland Cement Co. will begin the erection of a new plant on the west side of Slover Mountain, southwest of Colton. Five new kilns are to be installed. The company now has two kilns in operation at the old plant. The old plant may be abandoned after the new works are completed.

An explosion occurred in the coal room of the plant of the Peninsular Portland Cement Co., March 20th. Leon Graham, aged 20, sustained injuries which resulted in his death a few hours later. The cause of the explosion is unknown. Graham was employed as a sweeper. His body was burned in places, but death was caused by inhaling the flames.

Beaver Creek ranchmen are organizing a company to build a Portland cement plant near Swollows, Pueblo county, Colo.

Ohio capitalists are interested in the promotion of a Portland Cement Company to utilize the limestone deposits at Earlham, Madison county, Iowa, owned by S. A. Robertson.

The American Standard Cement, Lime and Stone Company has been organized at Martinsburg, W. Va. Capital stock, $500,000. It will manufacture Portland cement, lime and ship fluxing stone.

The internal troubles between stockholders of the International Portland Cement Co. have been settled. The plant will now start up with T. E. Beebe, superintendent. The company's works are located north of Elizabeth, Pa.

Contracts for machinery for the New Union Portland Cement Co. of Utah were to have been awarded on March 20th at the Pingree National Bank, Ogden, Utah. The bids were opened and awards deferred, except for Smidth Mills & Plummer, dryers.

The Art Portland Cement Co., incorporated for $500,000, now under construction at Kimmel, Ind., with an initial capacity of 250 barrels per day of white Portland cement, which is to be increased as trade justifies. The plant is to be in the market by August 1st of the present year.

W. F. Cowham and W. H. L. McCourtie of Jackson, Mich., will soon establish one of the largest Portland cement enterprises in the country. The properties are located in Iowa, but the company's headquarters will be in Jackson, with branch offices in St. Paul or Minneapolis.

The Egyptian Portland Cement Co. of Fenton, Mich., has resumed, having been reorganized. At the meeting of the directors the following officers were elected: President, Robert J. Whaley; vice-president, J. F. Williams; secretary and treasurer, E. D. Kennedy; general manager, C. L. Bussey; executive committee, G. W. Hubbard, J. P. Smith and Clarence Tinker.

The Old White Cliffs Portland Cement Plant of White Cliffs, Ark., may again come into operation. The trouble heretofore has been scarcity of clay, incompetent management and old style equipment. President Holmes of Kansas City is working hard to bring about the opening of the plant.

The Korty and Concrete Stone Co. of West Hoboken, N. J., has been incorporated, capital $10,000, to manufacture hollow concrete building.

The Elk Rapids Cement & Lime Co. have ordered one new 80 ft. rotary kiln, 7 ft. diameter, to be running by June 1. This will increase the capacity up to 1,000 barrels per day.

George E. Nicholson and associates of Iola, Kan., have purchased the Indian Portland Cement works located at Neodesha, Kan. The plant required considerable overhauling before it could be operated. The Hunt Engineering Company of Iola are in charge of remodeling the mill.

The Concrete Block Machine Manufacturers' Association has issued a forty-six-page pamphlet covering the proceedings of the convention held at Chicago June 27 and 28, 1905. The first page contains halftone cuts of the officers of the association, as well as the full report of the proceedings.

Charles Adams of Philadelphia is promoting a cement company to be located at Rogland, St. Clair county, Ala., on the Sea Board Air Line Railway, thirty miles east of Birmingham. S. S. Evans of Cedartown, Ga., has made a favorable report on the company's holdings, lime stone and shale deposits.

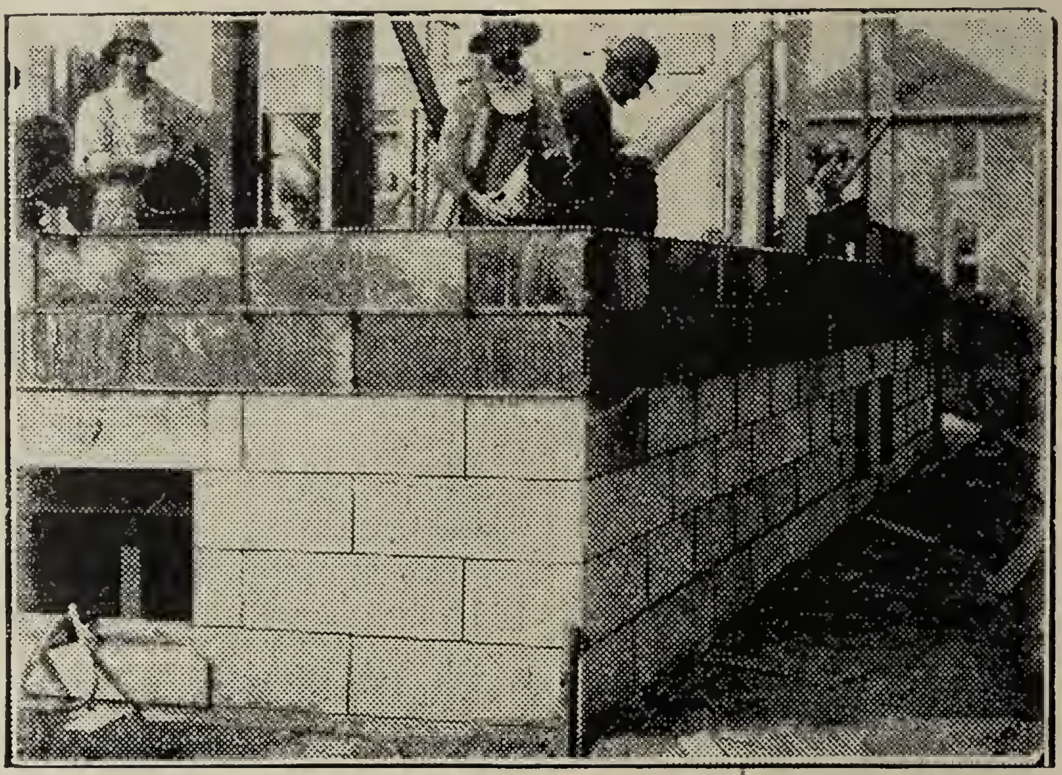
A jury in the United States Circuit Court on March 20th awarded the Wentz Engineering Co. $3,900 damages against the El Cajon Portland Cement Co. The plaintiffs sued for $20,000, alleging breach of contract in the matter of placing machinery in the cement factory. W. F. Cowhan is the promoter of this company.

Fourteen cement plants in Michigan produced 2,914,000 barrels of Portland cement in 1905, one-half of the output being sold in Michigan. One thousand three hundred and eighty three men were employed regularly in the mills. The fourteen plants cost $8,406,000. The cost of manufacture has been reduced with an increased demand for cement. The average daily wages is given at $2.20 per day.

The construction of a dam in Rock River, at Grand Detour, near Dixon, Ill., by the Sandusky Portland Cement Co., is meeting with opposition among a certain class of Dixon citizens, inasmuch as the dam will destroy the scenic effect of the beautiful cliff along the river front. The Dixon Historical Society is doing all it can to prevent the construction of the dam. A special act of Congress authorizes the cement company to build the dam.

POURED CONCRETE HOUSES.

Mr. E. T. Kemper, of Burlington, Ia., has invented a process of forming solid or hollow concrete walls in place by the use of two sets of metal plates or forms which are mounted on the walls, each form being 36 inches long by 12 inches high, with dividing or end plates. The inner forms or plates are corrugated leaving a mortice to key the mortar or plaster coat. By the use of these forms a continuous course is formed on the wall, except open spaces for doors and windows. The completed structure will form a monolithic construction. Our illustration represents a dwelling; architect, B. A. Mueller, of East St. Louis; under construction on the Kemper system, located at 2900 McCausland boulevard, at the above named city. The outside forms may be made to produce the various kinds of stone finish, such as rock face, rubbed stone effect, by simply having the desired pattern impressed upon the form which will leave the pattern in the concrete.



Erecting a Poured Concrete House.

BOOK NOTICES.

"Roofing Rules," a handbook on sheet metal in building construction for architects, owners, engineers and builders. Merchant & Evans, Philadelphia, Pa., publishers. Distributed free on application. The booklet covers Wood Shingles, Composition Roofing (Coal-tar and Felt Paper), Gravel Roofs (Slag), Terra Cotta (Clay Tiles), Slate Shingles and Cement Roofs.

The weight of the different kinds of roofing is given per square foot.

Metallic roofing, tin or copper tiles or shingles, corrugated V-crimped galvanized iron, sheet copper and roofing tin. The various roofing materials now on the market are discussed and compared with the Merchants Old Method roofing tin. Builders, contractors and engineers will find much valuable information on the subject of roofing in the booklet.

The U. S. Gypsum Co. will erect a new mill north of Eldorado Okla.

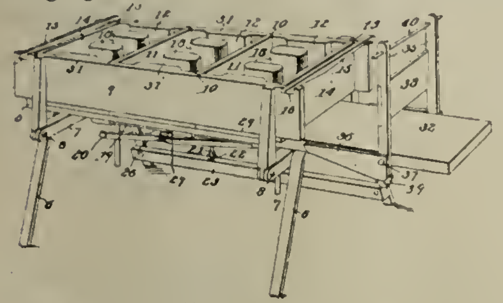
PROVISIONS AGAINST ACCIDENTS

The Monarch system of automatic devices for preventing accidents in mills and factories is described in severla pamphlets issued by the Consolidated Engine Stop Company of 100 Broadway, N. Y., which can be had on application. The Monarch system installed in a factory permits the stopping of machinery from any part of a building by pressing a push button. This insures greater safety and freedom from accidents, thereby limiting the extent of accidents to employes; in other words, it reduces the hazard to a minimum; and courts in accident cases look with favor on the latest modern devices installed in works to secure the greatest possible safety to employes, as doing away with willful negligence on the part of the employer.

This issue contains an article on the manufacture of hydrated lime as practiced in France, which deserves careful reading, as hydrated lime is coming into use for waterproofing concrete.

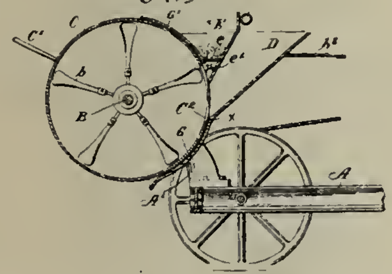
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS

808,643. Cement - Block Machine. Matthew Eckley, Archbold, Ohio. Filed June 21, 1905. Serial No. 266,363.



Claim.—4. In a machine for making hollow concrete blocks, the combination with a mold, of a bed-plate having one end thereof extended beyond the mold, and a tilting block-supporting frame pivotally mounted on said extension for changing the position of the blocks, the horizontal arms of said frame being normally disposed in the same longitudinal plane with the bed-piece.

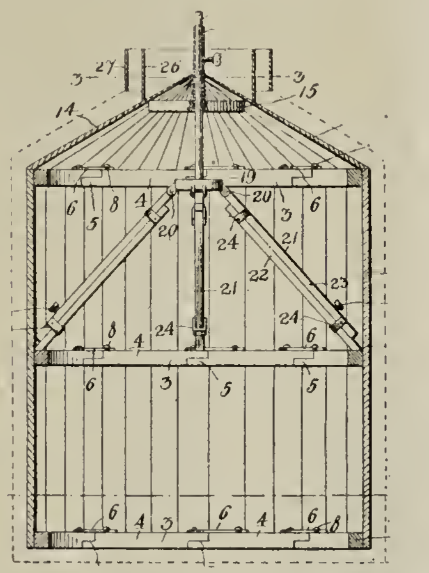
808,836. Method of Mixing Concrete. Peter C. Hains, Washington, D. C. Filed April 11, 1905. Serial No. 254,910.



Claim.—1. The improved method of mixing concrete which consists in wetting the inert material and then subjecting the wet inert material to the action of a cloud of dry powder cement to cause the particles of inert material to become covered with cement paste.

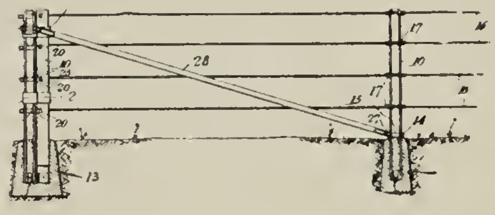
2. The improved method of mixing concrete which consists in wetting the inert material and moving the wet inert material in a cloud of dry powder cement to cause the particles of inert material to become covered with cement paste.

808,846. Mold. James H. Johnson and Henry Meyer, Fort Recovery, Ohio. Filed Sept. 7, 1905. Serial No. 277,389.



Claim.—1. A mold of the character described comprising a plurality of side mold-sections, a plurality of brace-sections engaged with said mold sections and having their abutting recessed ends overlapping, latches connecting said abutting ends of the brace-sections, an extension-plate or brace-section pivoted to one of said bracesections, and a clamp for securing the other end of said extension-section to the adjoining brace-section, substantially as described.

808,969. Fence-Post. Michael L. Boyce, Carroll, Iowa. Filed Sept. 11, 1905. Serial No. 277,941.



Claim.—1. A fence-post comprising a plurality of units each embodying parallel upright bars rigidly connected at the top, winding-rollers journaled in the bars and serving to space the same, means connecting the units with their planes disposed at an angle each to the other, and a base common to and in which the units are rigidly secured.

809,252. Cement - Block Machine.

FIRECLAY BRICK

STAR SILICA BRICK

CORNERS *in* QUALITY

We have have "cornered" the brick market—so far as **Quality** is concerned. It's an interesting story—but we have only space to outline it here :

The first chapter begins at the clay-mines. It shows how particular we are about **good raw material.** The grading is very thorough. At every step—inspection—selection—rejection, until our experts have the cream of the clay beds picked **out.**

The last chapter is a long way from the first—for it takes longer to wear out **Harbison-Walker Refractories** than any other fire-brick made.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

This is a true story—you can see the proofs any time in this office ; letters from users of refractories who have set down in black-and-white facts and figures which are the most valuable records of experience ever collected in the history of fire-brick manufacturing.

BUT CLAY AND CLAY DIFFERS IN DIGNITY WHOSE DUST IS BOTH ALIKE Shakespeare

1,100,000 DAILY CAPACITY
7,000 REGULAR CUSTOMERS

No Order Too Small for Our Best Attention. None Too Large for Our Capacity.

WE HAVE EXPERT KNOWLEDGE FOR YOUR BRICK TROUBLES
ALWAYS STATE FOR WHAT PURPOSE BRICK ARE TO BE USED

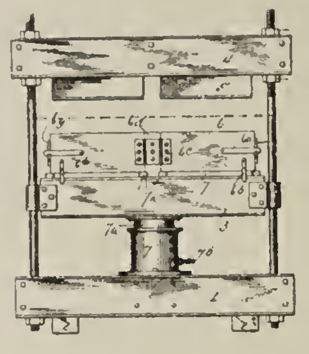
SEND FOR CATALOGUE "C"

MAGNESITE BRICK

Harbison-Walker Refractories Co., Pittsburgh, Pa.

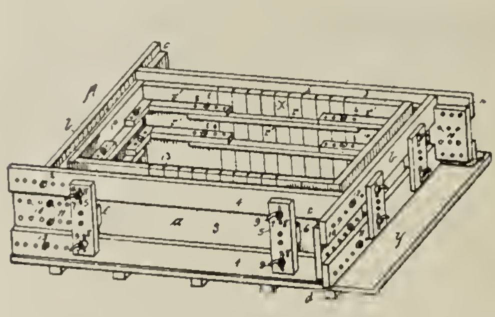
CHROME BRICK

Fred B. Dysart, Superior, Neb., assignor of two-thirds to C. E. Adams and A. C. Felt, Superior, Neb. Filed Aug. 18, 1905. Serial No. 274,737.



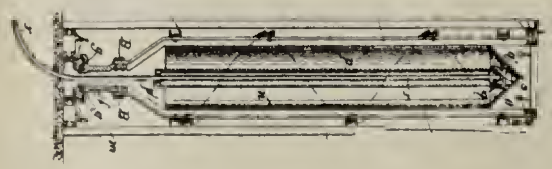
Claim.—In a cement-block-molding machine, a slidably-mounted bed-plate having supported thereon a mold-box formed with a central portion and provided with sides hinged on said central portion, also provided with ends hinged to one of said sides of the boxes and means for locking said end pieces on the opposite sides of the box, means for centering the mold-box on the bed-plate, and means for operating said bed-plate.

809,629. Burial-Vault Mold. John M. Pruett and Jacob C. Simpson, Rockville, Ind. Filed June 21, 1905. Serial No. 266,221.



Claim.—1. In an adjustable burial-vault mold, the combination of an adjustable outer form, composed of four independent walls, adapted to be assembled together in various positions, to render various-sized forms, suitable bolts adapted to hold said walls together with an adjustable inner form, consisting of four separate and independent walls, adapted to be assembled together in various positions to render various-sized forms, backs and bolts adapted to fasten the respective corners of the said form together, a cover-form consisting of four separate and independent walls adapted to be assembled together in various positions to render various sizes of cover-forms, and means of holding said walls in assemblage and one or more angular dividing-strips adapted to fit into the cover-form, all substantially as shown and described and for the purpose set forth.

809,680. Method of Making Pipes of Artificial Stone. Joseph Hall, Cheltenham, England. Filed Oct. 5, 1903. Serial No. 175,847.

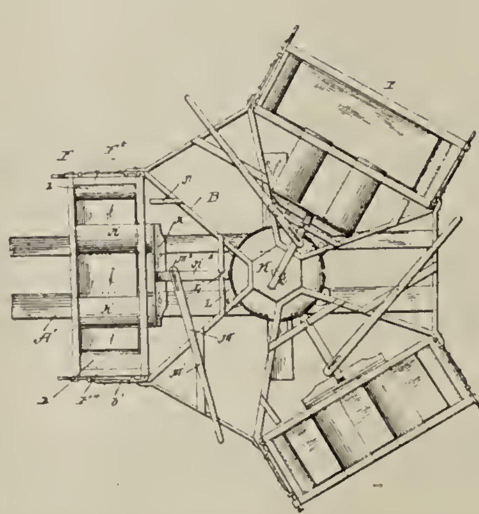


Claim.—2. A method of manufacturing a concrete pipe, said method consisting in molding a moist concrete mixture to shape by centrifugal force and simultaneously removing liquid therefrom, subjecting the molded pipe to external and internal pressure, and allowing the resulting pipe to set.

809,834. Cement-Brick Press. Horace B. Murdock, Detroit, Mich. Filed Feb. 21, 1905. Serial No. 246,720.

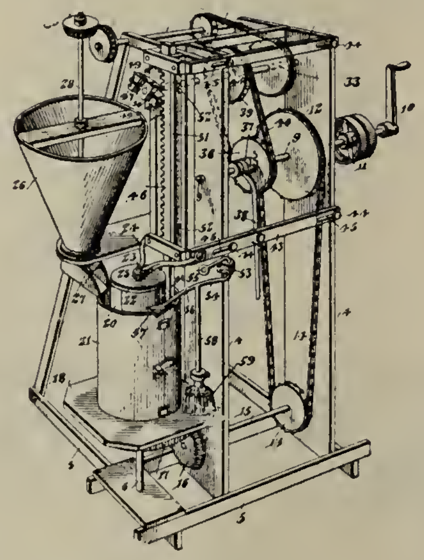
Claim.—In a brick-press, a pressing-punch and a table thereunder, means for placing a filled mold-box with its palette on said table, means for bringing said table and punch together to press the brick, and automatic means controlled by said actuating means for bringing forward a new palette when the brick is finished, and for placing a second new palette in proper position to be brought forward at the proper time, substantially as described.

809,901. Concrete-Block Machine. John A. Blake and Jay Kenrich, Wolcott, Ind. Filed April 3, 1905. Serial No. 253,394.



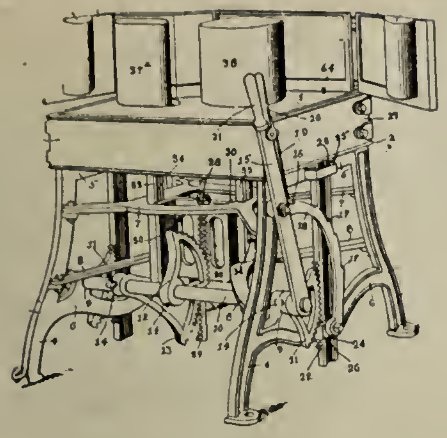
Claim.—In a machine substantially as described the combination with a revolving carrier having a series of mold-boxes and upper and lower press-heads between which the mold-boxes may be successively presented by the revolution of the carrier, of means for operating the opposite press-heads simultaneously and reciprocally whereby the object may be pressed without being moved out of its plane of movement, core-blocks movable transversely through their respective mold-boxes and means in connection with the revolving carrier for operating the irrespective core-blocks, substantially as set forth.

809,940. Tile-Molding Machine. Allen Glenn, Scranton, Iowa, assignor of one-half to Silas G. Kious, Scranton, Iowa. Filed Jan. 27, 1905. Serial No. 242,917.



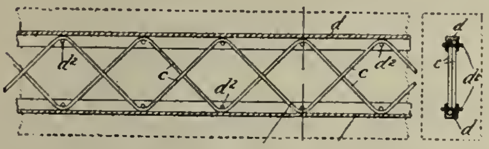
Claim.—In a machine of the class described, the combination with a rotable mold-support, of a movable tamping device coacting therewith, driving means, gearing connecting the driving means and support, gearing connecting the driving means and tamping device, said latter gearing including a clutch by means of which the tamping device can be stopped and the support rotated independently of the movement thereof, and means coacting with a mold placed on the support for finishing an article made in such mold, said means being normally stationary with respect to the support.

810,025. Machine for Molding Concrete Blocks. Walter G. Bennett and John F. Seyfang, Toledo, Ohio. Filed Aug. 3, 1905. Serial No. 272,522.



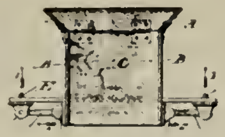
Claim.—2. In a machine for molding building-blocks, the combination of a support, a table provided with core-openings, mounted on the support, a core for each opening, means to jointly or severally project the cores different distances through their respective table-openings, and withdraw them therefrom, means to support the cores at different distances of projection through and above the table, and a plurality of articulated mold-boxes severally adapted either to individual or to collective use of the cores therein for the formation of complementary hollow structural blocks, substantially as set forth.

810,220. Reinforcing Device for Concrete Structures. Arthur S. Pierson, Morristown, N. J. Filed March 17, 1905. Serial No. 250,571.



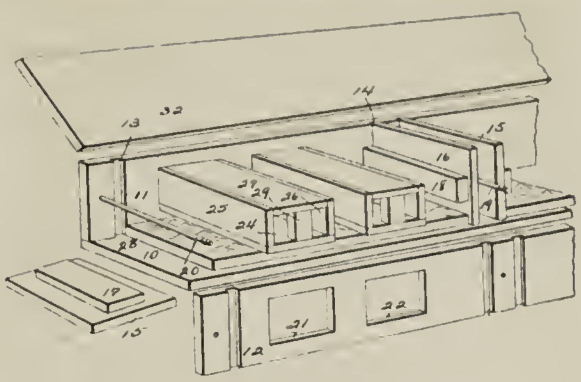
Claim.—1. A device of the class described, comprising parallel side bars and connecting-rods arranged diagonally between said bars and crossing each other at regular intervals centrally and longitudinally between said bars, said connecting-rods being connected with said bars so as to prevent their outward and inward movement, and said connecting-rods being continuous, substantially as shown and described.

810,343. Concrete-Block Mold. John M. Pettyjohn, Terre Haute, Ind. Filed May 29, 1905. Serial No. 262,855.



Claim.—1. The combination in a mold, of a hopper, a mold-box formed by separable sides and ends, hinged at their upper edge to the hopper, means whereby the mold may be lifted from the molded block, and means connecting the lifting means with the hinged sides and ends of the mold-box, whereby said mold-box sides and ends are imparted swinging action, substantially as described.

810,382. Mold for Cement Construction-Blocks. Malva M. Robertson, Des Moines, Iowa. Filed Aug. 10, 1905. Serial No. 273,567.



Claim.—In molds for forming construction-blocks containing air-channels, cores comprising a base having on its upper surface —?—?—?—?—trically to the axis of oscillation, and means controlled by the movement of the tool operated upon for oscillating said bearing-block whereby the grinding-wheel is caused to traverse each tooth at an angle to its path of motion.

CONSTRUCTED OF MIRACLE BLOCKS

Kalamazoo, Mich., Feb. 28, 1906.

Miracle Pressed Stone Co., Minneapolis, Minn.: Gentlemen: The picture I send you of the church was built with the Miracle double staggered air space blocks; no furring or lathing or plaster on the inside of the blocks. We built right over an old wooden church. Enlarged and remodeled it cost five thousand dollars. Sunday morning, Feb. 11, this church burnt, or rather the interior burnt. When the fire department got there, the interior, or old wooden frame was nearly consumed, and the interior walls were red hot, but two streams of water did not have the least effect on the blocks. They are neither checked nor cracked, and in passing, you would not know there had been a fire except that the glass is all broken and the roof caved in.

It surely demonstrates that the Miracle double air space block, if properly made, is fireproof and indestructible. Very truly yours,

(Signed) W. A. Drake & Son.

NEW CEMENT AND LIME PLANT.

The Cleveland Lime and Transport Co., of Cleveland, O., capitalized at $150,000, was incorporated at Columbus Wednesday. The company is backed by strong financial men. Operations will be begun early in the coming summer.

The incorporators of the company are John A. Kling, president of the Cleveland Builders' Supply Co.; J. R. Nutt, secretary of the Citizens' Savings & Trust Co.; D. T. Croxton, of the Bessemer Steel Co.; Worthington Hoyt and Attorneys C. W. Collister and A. V. Taylor.

Several large tracts of land, including quarry lands on Kelleys Island, have been purchased by the company, and the quarries will be opened on a large scale. Kilns for the manufacture of lime, cement and similar products will be built in Cleveland. The company has already secured an option on a fleet of small vessels, and Capt. C. E. Benham, formerly chief deputy collector of customs,, will be in charge. C. M. Crooks, of Youngstown, will be in charge of the quarries.

The offices of the company will be in Cleveland.

There is local evidence that the company means business. For some time agents have been at work and options were secured. A few days ago a prominent attorney closed the deal for the purchase of the H. Cattanach property of twenty acres, and the Cameron property adjoining, of thirty acres, making a total of fifty acres. The consideration was about $12,000.

The Cleveland company will erect large docks in the spring and open up the quarries.

Louisville, Ky.—Central Concrete Construction Co. has been incorporated with $25,000 capital stock to manufacture concrete blocks, etc.; daily capacity, 1,000 blocks.

Glenns Run, Tenn.—Riverside Litho-Concrete Co. has incorporated with $25,000 capital stock to manufacture and deal in cement, concrete blocks, artificial stone, etc.

A new company has been organized at Waukesha, Wis., for the manufacture of concrete blocks and other building material. The capital stock is $15,000. The officers are: W. P. Sawyer, president; J. A. Rodgers, vice-president and manager; W. H. Hardy, Jr., secretary; Carl H. Sawyer, treasurer.

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HEAD BURNER, with good experience in both wet and dry processes, desires to change position on January 1st, 1906. First-class references furnished. Address T. J. G., Alsen, Green Co., New York.

POSITION WANTED — By young man thoroughly experienced in the office end of cement manufacturing, and with over one year's experience as superintendent of small plant. Best of references. Address E. D. T., care of CEMENT & ENGINEERING NEWS.

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Superintendent for large Portland Cement plant in the Middlewest; must be good engineer. Should understand both wet and dry process. Give reference and salary expected. Address P. O. Box 84, Detroit.

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For a Portland Cement plant, working lime stone. Reasonable salary to start, with prospective increase. Address "O. H." care Cement and Engineering News, Chicago, Ill.

WANTED

A thoroughly competent chemist with college training and practical experience desires position as chief chemist with some cement company. Reference given. Address "Chief Chemist," care Cement and Engineering News.

WANTED

Chemist, college graduate with 7 years practical experience as chemist and superintendent of Portland Cement plants, desires to make a change. A 1 references. Address "B. C.," care Cement and Engineering News.

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POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

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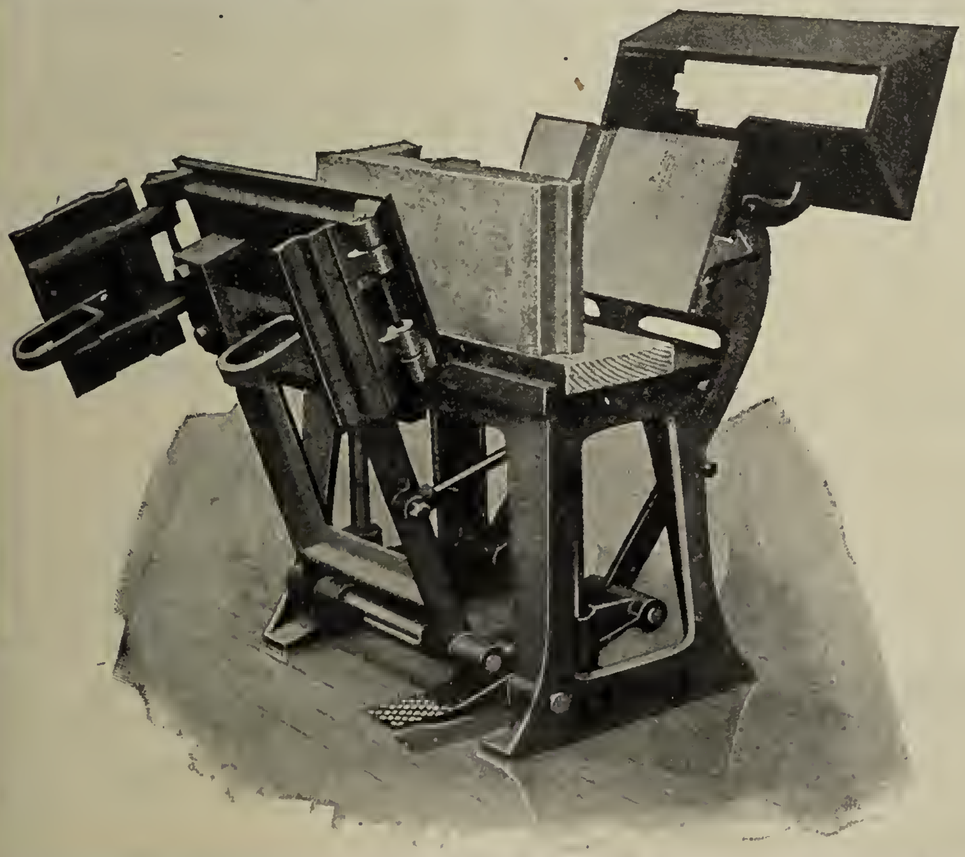

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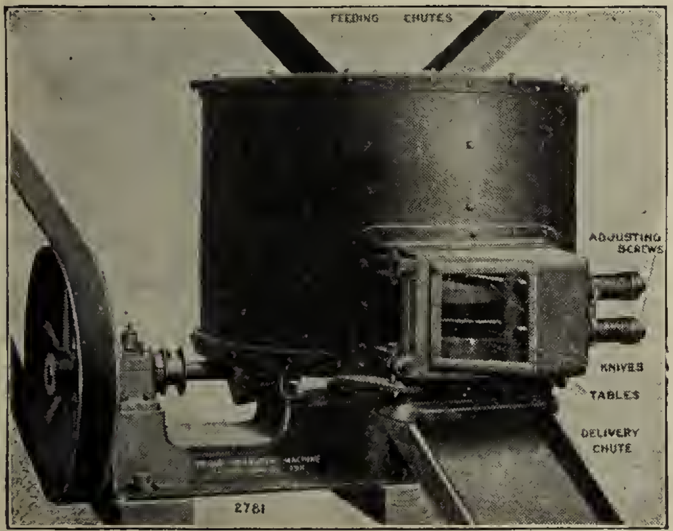

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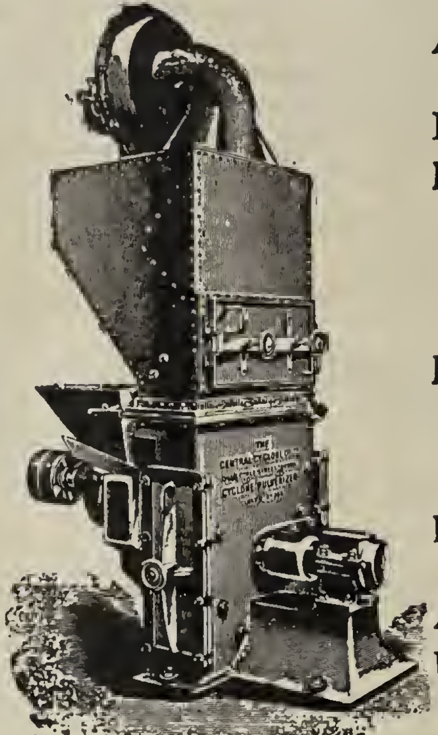

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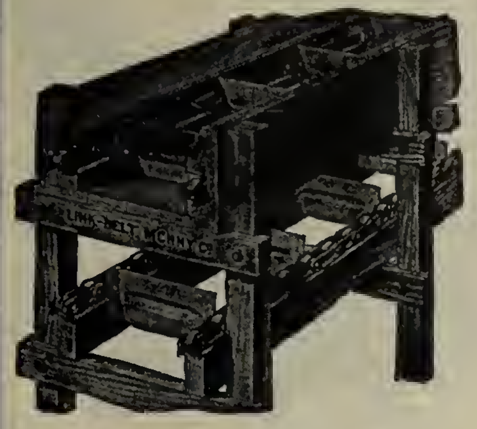

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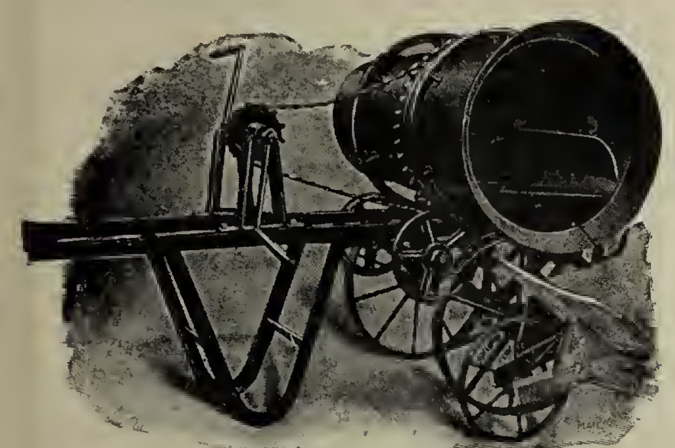

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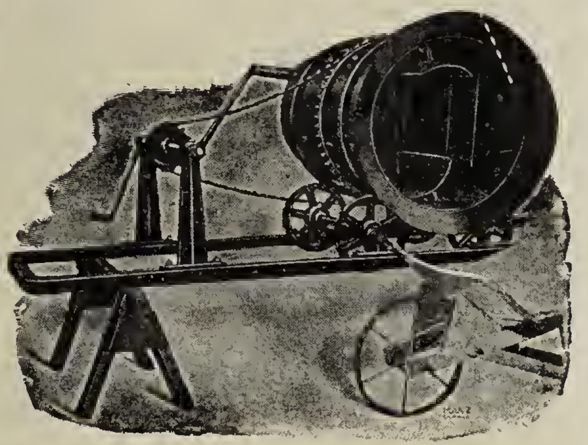

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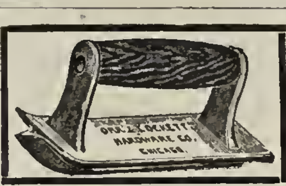

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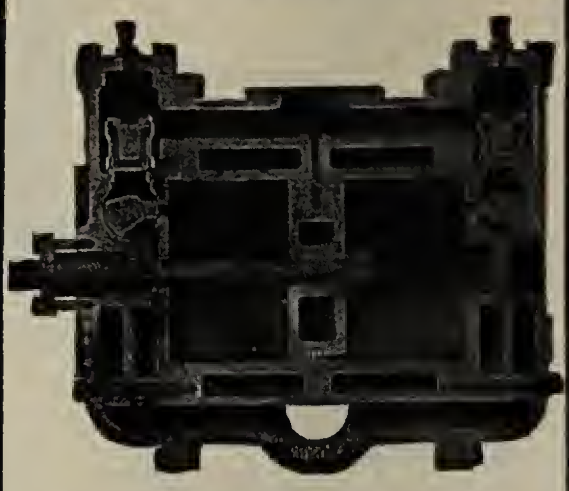

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How Many Thousands of Cement Stone Buildings Will Be Erected in 1906?

There's a question Contractors, Builders, and al who have to do with building may well ask themselves.

The enormous use of Cement Stone in buildings of all kinds during 1905 has compelled the conservatives in the building trade to "sit up and take notice."

The increase in 1906 over 1905 will be marvelous; better perhaps, to say phenomenal.

Builders can no longer ignore the sterling value of perfectly made Cement Blocks, either from the standpoint of economy or artistic beauty.

Men with foresight in the building trades all over America, and even across the sea, are falling in line, and are looking for the best Cement Stone Machine made.

In choosing a Cement Stone Machine don't be carried away with the vociferous shouting and constant clamoring of manufacturers who claim without reason, that their machine is the best, or even "Better than the Best."

THE HERCULES CEMENT STONE MACHINE IS

NOT BETTER THAN THE BEST
BUT BETTER THAN THE REST

A fact that is easy to prove to any intellectual Builder or Contractor who will take the trouble to write for our new beautifully illustrated Catalog G.

The simplicity of construction in the Hercules is one great feature; this combined with its automatic action and accurate mechanism and the combination arrangement which permits two stones of different sizes to be made on the one machine at the same time, is the reason that the Hercules makes more blocks in less time and for less money than any other machine.

The Hercules is an adjustable machine—perfectly and easily adjustable—and that is why it can make blocks ranging in size from two inches to six feet, accurately and perfectly.

Being simple in construction, the Hercules is easily kept clean and does not require high-priced labor to operate.

In the Hercules the plate that makes the face of the stone rests on the bottom. This allows the operator to tamp directly on the face, enabling him to get a very clear and accurate impression of the design, which comes out as natural as cut stone.

MADE ON HERCULES

Tamping directly on the face also permits the builder to make a stone with a fine clean-cut face and a coarse back—a clear saving of material.

If you are going to own a machine, you will want the one that will make the strongest blocks—blocks with a crushing strength equal to natural stone.

Well, that's just why we call this Machine the **Hercules**—the name denotes strength—wonderful strength—and the Hercules Machine does not belie its name, for with our method of tamping, with a big flat tamper, the Hercules makes stronger stone than can be made on any other machine.

The Hercules makes solid blocks and hollow blocks. The hollow blocks are made with more air space than those made on other machines, which, as you can readily see, means a great saving in material —which means money.

You can smile at competition if you have a Hercules; smile right out loud if you choose, for you can make blocks much cheaper, much stronger, much more natural looking than any competitor who uses any other machine.

You can make a larger number of designs, too; over fifty half-tone designs of facings are shown in our new Catalog.

On the ONE machine, the Hercules, you can make in addition to solid and hollow stone: Water Tables, Window Sills, Lintels, Coping, Steps, Flagging and the like.

We want you to send for our new catalog, showing our 1906 Model—we want to prove to you that the Hercules will do anything that's worth doing better than any other machine, and will do other things besides.

SEND FOR CATALOG G TO-DAY. *Lumber is going higher—natural stone won't go lower, that's a sure prophesy—and Cement Stone is the building material of the immediate future. Catalog G will tell you lots of things you ought to know about stone making. Send for it to-day. Send for it right now.*

Century Cement Machine Co., 182 West Main Street
ROCHESTER, N. Y.

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,

228 La Salle St., CHICAGO, ILL.

10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
Write for Catalogue D. Washington, D. C.

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December

1897
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January February

WE PAY 25 CENTS EACH FOR ABOVE BACK NUMBERS

CEMENT AND ENGINEERING NEWS
162 La Salle Street, CHICAGO, ILL.

Fire Brick Linings
For Cement Kilns

STANDARD TESTING SAND AND GENERAL BUILDING SUPPLIES

Garden City Sand Co.,
188 Madison St., Chicago

CEMENT

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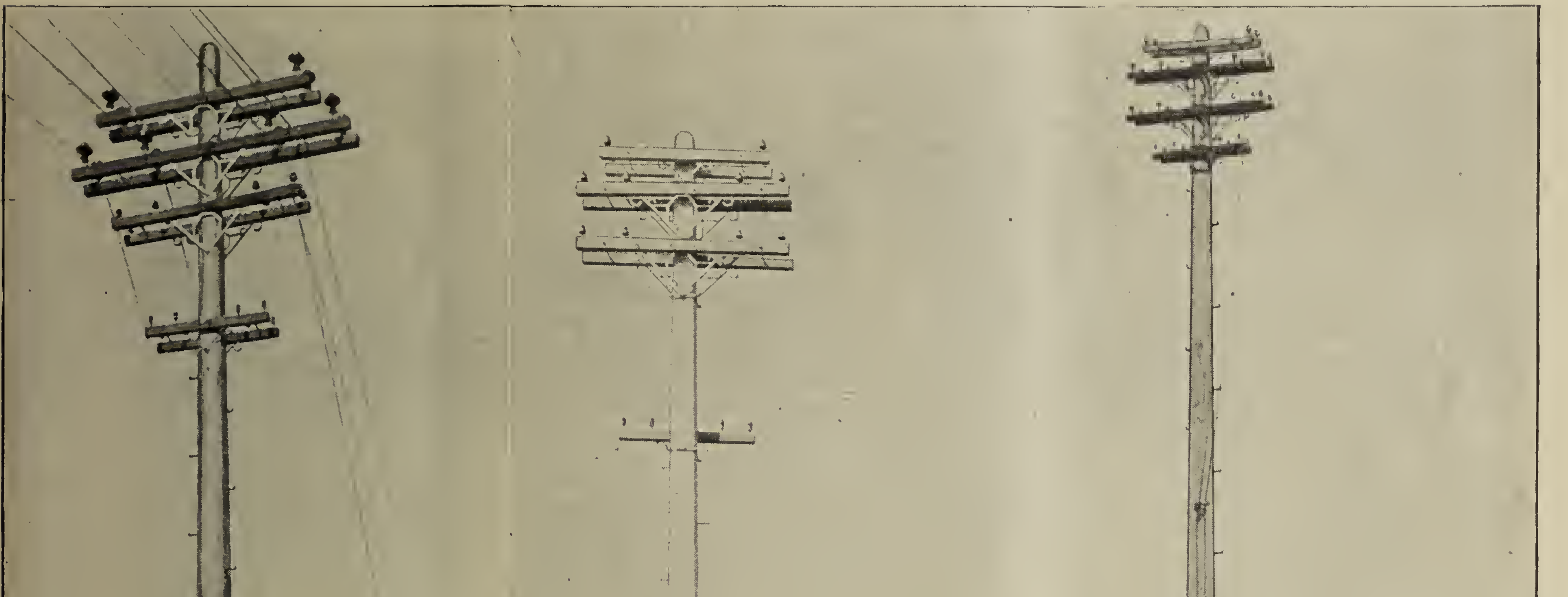
ENGINEERING NEWS



Reinforced Concrete Poles, as installed on the Welland Canal, used for Conveying. Electric Wires over Railway Crossings. See Page — for description see page 97.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
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"This world belongs to the energetic."

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, APRIL, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches. Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE SAN FRANCISCO DISASTER.

Earthquake and fire have created ruin and havoc in San Francisco, two-thirds of the city being in ruins. The modern sky-scraper, with its structural steel framing, threw off its curtain walls, leaving only the bare, naked skeleton, which may be reclad anew with external walls at small cost, while brick and stone masonry with few exceptions fell and crumbled into rubbish. With the water service destroyed the wooden structures in the residence districts became simply food for the flames. Concrete and reinforced concrete structures survived both earthquake, flame and fire. The Western Electric building with its reinforced concrete floors and framing remains uninjured. Reports from Palo Alta with its stately university building constructed for the Leland Stanford, Jr., University likewise survived, while the brick and stone masonry buildings were more or less injured. The reinforced concrete buildings at the Stanford University were built by Ernest L. Ransome, on the Ransome system of concrete and twisted iron. The gun emplacements in and about the harbor, likewise constructed in reinforced concrete, are practically intact, while the gun mountings on the same concrete base were destroyed. Concrete and steel therefore seem to combine the highest resistance to both fire and convulsions of nature caused by earthquakes. These demonstrations of fact must carry weight in the rebuilding of the city. To build well will be to build of concrete and steel. The one important question on the Pacific coast will be, where shall we obtain cement, as even under ordinary conditions prevailing last season there was a cement shortage for weeks. It might be well for our mills to ship a million or more barrels via Cape Horn; it would certainly be picked up at good prices and be appreciated by the consumer.

The cement shortage last year called for 600 cars of cement under a single order from Kansas. The money that is now being raised for the stricken city might in part be invested in cement to the great advantage of all concerned. Should the cement shortage become acute, the transcontinental railways will undoubtedly make special rates on cement to the coast.

British Columbia authorities have seized 8,000,000 feet of logs designed for export to the United States. This is another indication of the growing scarcity of our timber supply and that concrete must eventually displace wood in many lines of construction.

Suits have been entered against the Rockland-Rockport Lime Company at Rockport, Me., in the Knox county courts to abate a nuisance caused by some twenty lime kilns on the water front in the vicinity of Front, Camden and Maverick streets at Rockport, which emit dense clouds of smoke, resulting in damage to property in the vicinity, as well as to the health and comfort of the citizens of Rockport, the smoke being so dense at times that it is difficult to distinguish day from night.

The injunction against the Egyptian Portland Cement Company in the U. S. court at Detroit has been dissolved. Labor claims are being paid as fast as presented. The mill will be started up as soon as possible with a large force of men in order to take advantage of the large demand for cement. At the meeting of the Egyptian company directors the following officers were elected: President, Robert J. Whaley; vice president, J. F. Williams; secretary and treasurer, E. D. Kennedy; general manager, C. L. Bussey; executive committee, G. W. Hubbard, F. P. Smith and Clarence Tinker.

PRODUCTION OF CEMENT IN 1905.

The total production of the various kinds of hydraulic cement in the United States during the year 1905 was 40,894,308 barrels, valued at $36,012,189. This was an increase of 9,219,051 barrels, valued at $9,980,269 over the production of 1904. Of the total amount of cement manufactured in the United States in 1905, 36,038,812 barrels were Portland cement, with a value of $33,326,523; 4,473,049 barrels were natural rock cement, valued at $2,413,052; and 382,447 barrels were slag or Puzzolan cement, valued at $272,614.

American Industries, published by and for the manufacturers of the United States, is one of the best exchanges we have on our list. Its object is to unite and consolidate the manufacturing interest of the country. It deserves the cordial support of the business men of the nation. Subscriptions, $1.00 per year. Address American Industries, 170 Broadway, New York.

OXYGEN HELMETS.

Oxygen smoke helmets are now supplied by the German and Austrian governments to the city fire departments, which enables the firemen to enter buildings full of smoke or other noxious gases, to rescue persons overcome by these gases. The use of this class of helmets is compulsory in certain German and Austrian coal mines. Each helmet must bear the government inspection mark before it can be used. The German coal mining engineers who volunteered their services in rescuing the imprisoned miners at the late French coal mine disaster were enabled to enter and explore the various chambers, being equipped with the oxygen helmets.

REMOVAL NOTICE.

Cement and Engineering News will remove its office from 226 La Salle street to 22 Fifth avenue, Rooms 504, 505 and 506, formerly accupied by the Chicago & Northwestern Railroad Company.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	....	....	....	....	6,997,424	$ 22.910	6,830,780	$ 21,936
Belgium..........	8,864,935	$ 27,238	19,242,170	$58,700	115,205,598	377,677	90,709,638	279,784
France..........	....	....	11 316	115	5.511,299	21,713	5.318,476	19,685
Germany..........	4,234,617	16,086	2,916,586	....	153,754,787	519,580	134,689,892	452,423
All Other Europe	....	....	396	1	1,226,901	4,219	396	1
British North Am.	....	....	....	....	144.915	763	39,650	247
Other Countries..	2,000	10	300	2	1,871,264	7,166	54,155	501
TOTAL..........	13,101,552	$43,334	22,170,768	....	284,712,188	$951,028	237,642,987	$774,577
Domestic Exports of Cement, bbls.	33,102	$56,710	25,987	$41,092	669,687	$950,252	618,154	$854,516

There were 13,450,678 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in February 1905, valued at $43,032, against 5,873,659 lbs. in February 1906, valued at $17,502.

For 8 months ending in Feb. 1905, there were 89,296 tons of asphalten imported in the United States, valued at $353,933, against 44,055 tons imported in 8 months ending Feb. 1906, valued at $202,104.

ANCIENT HYDRAULIC CEMENTS.

Hydraulic cement was first made by the Romans, who used it in the building of their temples, 509 years before the Christian era. It was made of a mixture of lime and volcanic ash, shown as puzzolana, an ash found at the foot of Mount Vesuvius, near the city of Pozzuoli.

The scarcity of sand and the great abundance of puzzolana caused it to be substituted for sand for making mortar, which was used in laying brick and stone masonry. The fact that puzzolana and lime possessed hydraulic properties was not known for some time after it had been used for ordinary masonry. Large masses of this concrete still exist, over 2,000 years old, in a good state of preservation.

In the temple of Castor, built in 496 B. C., this concrete was largely used. In the temple of Concord, a part of the forum built in 349 B. C., similar masses are found. In the Paladium, 300 B. C., are massive remains of some large cella, nothing of which now exists except the concrete core, although it was probably lined with marble.

In 24 B. C. the Pantheon was built with walls 20 feet thick, and the dome covering the central portion, 142 feet 6 inches span, was cast in concrete, made of pumice stone, puzzolana and lime, this dome being in one solid mass. The walls and dome are still intact. The Coliseum, finished in 79 A. D., was almost wholly built of concrete. Later structures were built by the Romans and also by the Moors, as many Moorish palaces along the Mediterranean bear testimony.

In Greece calcareous cements were used in the time of Pericles and Plato, 429 B. C., by the citizens of Athens, who decorated their houses with stuccos, in the style of classical art, then in its prime. This cement stucco would receive a polish and hardness compared with Parian marble, while artificial pavement was brought to such a high state of perfection as to resist the absorption of water. Failures in this respect were recorded in exceptional cases.

Vitruvius, 27 B. C., a Roman architect, laid down certain rules for producing calcareous cements artificially. The Vitruvius formulas have been found imperfect compared with the formulas of to-day. In 1812 Vicut began his investigations on the materials and properties of hydraulic cements, which produced a revival throughout France and Europe in a comparatively short time.

An analyses, made by Dr. Malcomson, of the cement used in laying the masonry of the Pyramid of Cheopus, built about 3,000 B. C., gave the following results:

	Grains.
Soluble salts, consisting of sulphates of lime and soda....	18.5
Carbonic acid	5.64
Lime	10.7
Alumina	0.3
Insoluble matter consisting of alumina and crystals of selenite	54.7
Water associated with carbonate of lime and loss........	10.16
Total grains	100.00

Pliney describes a cement known as Roman Maltha, made by mixing fresh burned lime, slaked with wine, and beaten in a mortar with hog's lard. This mixture is said to possess great tenacity and acquires the hardness of granite.

The Maltha of the Greeks was made by mixing milk with lime and sand. Both of these cements were used for stucco work and outside plain plaster coating. Previous to applying the Maltha the surface of the wall or ceiling was smeared over with oil to make the composition adhere. A species of Maltha used at present by the inhabitants of Tunis and other places in Africa for surface coating work is prepared as follows:

One measure of sand, two of wood ashes and three measures of sifted lime, mixed together with very little water. After the mixture has been well beaten, a little oil is added; the beating is then resumed and continued for three or four days at intervals, the proper degree of softness being preserved by alternately adding small quantities of water and oil. In a short time after it has been laid on the work it acquires the hardness of stone. The ancients made a cement of slaked lime mixed with bullock's blood and powdered scales of oxide of iron. This cement is said to be very strong and durable and was used for the best class of work only. This formula is now and then used in restoring brown stone fractures of to-day. The writer has used it for this purpose on repair work in Chicago within the last eighteen years.

A gray colored cement used in the construction of the mausoleums of Tartar princes was made of unslaked lime, powdered charcoal and sandstone dust. The mortar joints, one inch thick, between well burned brick, had acquired such great strength and bond that it was almost impossible to separate the cement from the brick.

The Fairmont Cement Stone Manufacturing Co., of Fairmont, Minn., F. A. B. Patterson president and H. D. Geith secretary and treasurer, has erected a 50x100 cement block building to be used as a factory for making cement brick and building blocks. The building has two curing rooms attached, one 24 by 50 feet, and the other 16 by 40 feet. Ten thousand cement brick will be turned out daily and a large number of cement block. The cement products are handled by an overhead trolley from the factory to the yards. The company has fifteen cars of building block on hand ready for the spring trade and forty cars of cement sidewalk tile. The company operates branch works at Blue Earth, Armstrong, Sherburne, Ceylon, Brycelyn and Trueman. All work is guaranteed. Mr. Patterson is likewise interested in a cement block factory and plantation in Cuba.

The Alabama Portland Cement Co., Ltd., of Demopolis, Ala., has been incorporated under the laws of England. The certificate reads as follows: "I hereby certify that the Alabama Portland Cement Company, Limited, is this day incorporated under the companies acts, 1662 to 1898, and that the company is limited. Given under my hand at London, this 21st day of December, 1900. Signed Ernest Cleave, registrars of joint stock companies. Fees and deed stamps, £30, stamp duty on capital £250."

The nominal capital of the company is £100,000, divided into 9,950 ordinary shares of £10 each, and 500 founders shares of £1 each.

The papers were filed with the Secretary of State at Montgomery, Ala., on March 21, 1906.

Berkley & Norfolk, Va., information reports that the American Cement Company will erect a plant at Berkley, Va., this season. The Norfolk Pilot says the American Cement Company has purchased several farms in the neighborhood of Chuckatuck carrying blue and yellow marl, and that options have been secured on other farms having the same materials. These lands are about ten miles from the proposed site for the plant.

Hudson Portland Cement Company, to deal in Portland cement; capital, $10,000. President, Otis Weld Richardson; 9 Bay State road, Boston; treasurer, Addison R. Pike, Winchester, Mass.; clerk, Howland Twombley, Newton, Mass.

The Mason City Portland Cement Company is purchasing machinery. Core drills are at work on the company's rock deposits. Each core obtained is being tested preliminary to locating the mill.

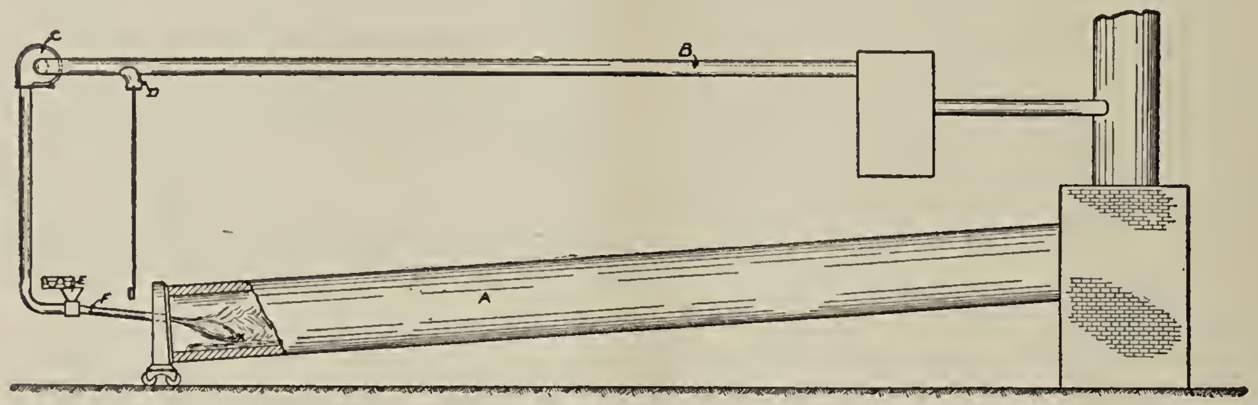
The Elk Rapids Portland Cement Company agreed to furnish 4,000 barrels of cement for Traverse City, Mich., at $1.70 per barrel in paper and $2 in wood. The Newaygo and Alpena cement companies made the same bid through agents.

A NEW KILN FIRING PROCESS.

The new kiln firing process now being used by the Lawrence Cement Company, Siegfried, Pa., has been accompanied with such tangible results in the increase of output and saving of fuel as to call for comment from cement manufacturers all over the country. When further trial has demonstrated the superiority of this method it is probable that it will speedily take the place of other processes now commonly used. The principle on which the new firing process rests is covered by patents granted to Mr. Byron E. Eldred. It has always been the aim of cement manufacturers to obtain an impinging flame with pure air blast. But experiments on this basis always resulted in an overheated flame and consequent destruction of the linings of the kiln. Until Mr. Eldred brought out his process, the impinging flame was regarded as a problem which had yet to be solved. Mr. Eldred found that by diluting the air used to support combustion with a certain amount of the waste stack gases from the kiln he was able to generate heat at points where it was most needed. His discovery resulted, as stated, in an increased output of cement clinker due to the improved application of the heat.

In order to burn cement with economy just enough air to accomplish complete combustion of the powdered coal used should be supplied to the kiln. Excess of air means unnecessary heat loss at the stack. Further improvement in the operation of the kilns under the new process is found in the improved calcining effect. To properly calcine the material, a flame differing in quality from that ordinarily secured in the upper part of the kiln is desirable, so that a tempered impinging flame of lower temperature than an axial flame of high temperature is more efficient for the production of cement clinker. The waste gases of the kiln afford a means of changing the atmosphere in which the powdered coal burns to any extent necessary for the production of a specified calcining flame. The diluted air also serves a useful purpose in lengthening the effective calcining flame. This long flame, however, does not cause the gas to leave the kiln at a high temperature. In most cases the stack temperature is less and the loss of heat of the stack gases less under the Eldred process than when the ordinary method is employed. In the accompaning diagram the method of operation of the new process is clearly shown. The waste stack gases of the kiln are conducted through the conduit "B" by the exhaust fan "C." At "D" is an air opening through which, by means of dampers, the amount of oxygen in the mixture may be accurately controlled. The fan "C" discharges this mixture into a coal feeding apparatus "E," from which it passes to the pipe "F" into the kiln "A." The pipe "F" is so arranged with reference to the kiln that the hottest part of the flame "X" is in direct contact with the material. The kiln operator is able, by means of a lever attached to the air damper at "D" to regulate the air mixture to suit any conditions in the kiln. When "rings" form an increase in the percentage in stack gases can be easily made and will usually result in their speedy removal.

At the Lawrence Cement Company's mill each of the eight kilns in operation has increased its output about 8 per cent and resulted in a decrease of fuel consumption of about 5 per cent, and in all cases there has been no change in the quality. The installation was made by the Combustion Utilities Company of New York.



Eldred Kiln Firing.

Judge Watkins, receiver for the Toledo Portland Cement Company of Michigan, has been granted permission by the circuit court sitting at Ann Arbor to commence suit for $50,000 against the following Toledo, O., capitalists: John Rochford, R. T. Van Valkenburg, A. W. Butler, William Watts, G. T. Butler, W. O. Holst and John Beck. This company has had a disastrous career. It was organized by Toledo and Manchester people and was expected to prove a gold mine. It has never earned a dollar, however, and in fact the plant has not been completed nor operated, and the concern is a complete wreck financially. Its property was abandoned and was going to rack and ruin when the receiver took charge.

TANTALITE THE HARDEST OF METALS.

Messrs. Siemens and Halske, of Berlin, have invented a new incandescent electric lamp. The filament is made of tantalite, a new metal possessing extraordinary hardness. Dr. Werner Von Boulton, in describing this metal before the Electro-Technical Association of Berlin, said sheets of tantalite were so hard that a diamond drill driven at the rate of 5,000 revolutions per minute for three days and nights continuously on the face of a sheet of the metal failed to penetrate it, a scarcely noticeable impression being made. The diamond drill itself was dulled. Messrs. S. & H. intend to manufacture tools and others articles of tanatlite. Writing pens made of tantalite resists the action of chemicals to a very high degree; it is even more elastic than a gold pen and practically indestructible, and is likely to supercede both steel and gold pens when placed upon the market.

PHILADELPHIA LETTER.

Sales of Portland cement during the earlier part of April were brisk and at present writing are very good, due to the favorable building outlook. Large and small contracts for all sorts of structures continue to be let every day. During March 876 permits for 2,034 building operations, costing $5,132,545, were let. Of the permits issued, a surprising number showed that the operations were for concrete or reinforced construction, wholly or in part.

The building situation in Philadelphia and vicinity is in good condition. At Trenton, N. J., a building trade strike was averted by the employers granting a small advance of wages. At Harrisburg, plasterers on strike, returned to work at $3.50 per day—an increase of 50 cents a day. At Shippensburg, Pa., labor troubles were settled. As noted, the general outlook is good.

Local quotations on Portland cement are: Rosendale, or natural, in good, per bbl., 90c; German Portland, per bbl., $1.90@2.10; American Portland, per bbl., $1.60@1.75. Prices advanced slightly the past month on American Portland cements.

A matter that may cause cement manufacturers of the East more or less trouble is the strike now on in Pennsylvania of the coal miners. Should the coal strike last a long time mills may have to shut down for coal. At present no particular apprehension is felt; supplies of coal on hand are fair, and there is considerable in the yards of the coal mining companies.

The alleged faulty construction of a reinforced concrete hotel roof at Atlantic City, N. J., caused the death of Arthur Still early in April and the city council of that city has been urged to pass an ordinance regulating concrete construction.

At Easton, Pa., a mortgage given by the Atlantic Portland Cement Co. to the Northampton Trust Co., for $1.500,000, has been filed.

Work on the large reinforced concrete dame at McCall's Ferry, Pa., is being vigorously prosecuted by the McCall's Ferry Power Co. Over 1,000 men are now at work. Martin Lee, F. Begette and John Connelly, workmen, all of Portland, Me., met death by drowning, April 7—the first serious accident on the work.

Lewis Williams, cement pavement contractor at Camden, N. J., reports ever increasing demand for cement sidewalks, curbs and cellars and is very busy on good contracts. B. F. Kellum, of Camden, has taken up cement work in all its branches and is very busy.

The John A. Kelley Co., of Philadelphia, will quarry, build, etc., including concrete construction.

Local contractors are watching with interest an "open shop" school plan being conducted at Wilkes-Barre, Pa., by building contractors of that city. There has been an 18-months' fight on for the "open shop" and to secure competent employes the Employers' Association raised an endowment fund of $50,000 and opened a trade school where young men are taught bricklaying. Later a carpentry and other classes will be opened. Already many young men graduates of the class in masonry are at work for the employers and the school promises to be the medium through which the union shop will be rendered impossible.

City Solicitor Townsend, of Wilmington, Del., severely criticised the new building ordinance before City Council, alleging its phraseology was imperfect, etc., and the ordinance went back to the building inspector for amendments and corrections.

The Delaware, Lackawanna and Western R. R. has decided to survey a new route in order to tap the cement belt of Pennsylvania. The branch road will run from Siegfried to Mahoney City, instead of to Hamburg.

The Standard Sanitary Co., of New York City, manufacturers of bath tubs, sinks, etc., has purchased 12 acres of land at Camden, N. J., and will erect a $500,000 plant. The several buildings will be of reinforced concrete construction, according to present plans.

King, Killough & Co., local contractors, will build office, car barn and power plant buildings, of stone and concrete, for the Fayetteville (W. Va.) Electric R. R.

Wm. Steele & Sons Co. have started work on the new $500,000 baking plant of the Freihofer Vienna Baking Co., 20th and Clearfield streets. There will be some eight buildings in all, to be of reinforced concrete and brick construction. When finished it will be the largest baking plant in the world.

Among local concrete constructions either under way or under contract, are: Chalfant Bros., coal dealers, a one-story concrete engine and boiler house; Morse, Williams & Co., elevator manufacturers, a two-story reinforced concrete addition to their plant on Wildey street. The A. Berg Co., glue manufacturers, are building a three-story reinforced concrete factory building, 98x225 feet, on Ontario street. The Eshleman & Craig Co., are building a reinforced concrete laundry structure, on 20th street, to cost $7,000. Exterior walls of kilns, etc., being erected for the H. I. du Pont Powder Co., near Wilmington, Del., are of reinforced concrete.

At Easton, Pa., April 7, Sheriff Roberts sold the plant of the Quaker Portland Cement Co., at Sandt's Eddy, to H. D. Maxwell, attorney for execution creditors, for $5,000, subject to quite heavy encumbrances. It is understood the Alpha Portland Cement Co. will take the plant.

At Rickett's Station, Pa., the Ambursen Hydraulic Construction Co. has commenced work on a reinforced concrete dam to be 400 feet long and 32 feet high.

Civil Engineer C. G. Darrach read a paper, "Design, Installation and Maintenance of the Modern Office Building," before the Franklin Institute, the past month. He described the most recent use of steel reinforcement in concrete construction, among many interesting things. The lecture was illustrated with screen pictures.

The Reid-Turnbull Construction Co., 1206 Pennsylvania building, is a new concern, capitalized at $75,000, which will give special attention to concrete work.

The American Bridge Co. was awarded the contract the past month for steel to be used in the Philadelphia rapid transit subway in Market street from the City Hall eastward to the Delaware river. This section of the subway will be almost entirely of reinforced concrete, and it is said the Vulcanite Portland Cement Co. has orders for thousands of barrels of cement to be used in the work. Construction work is being pushed vigorously. Closely allied to the subway improvement is the plan of the Philadelphia and Camden and Inter-City Link R. R. to tunnel the Delaware river, connecting the two cities named. The tunnel, which will cost over $3,000,000, will be constructed mainly of reinforced concrete and steel. Wolf Bros., bankers, interested in the project, say funds are in sight and that work will probably commence within six or eight months.

William Leisenring, a pioneer in the Pennsylvania cement industry, died at Cementown, Pa., the past month, at an advanced age.

The Pacific coast disaster, it is reported here, has led California capitalists to abandon their plan to erect a million dollar cement mill near South Bethlehem, Pa. The Atlantic Portland Cement Co., recently granted a State charter, seems to be the company the Californians were operating through, although this is not known to be so.

The Ward-Franz Co., of this city, will apply for a State charter to do general building and construction work and to deal in cement and other building material.

C. O. Mailloux lectured on "Mechanical Integration" the past month before the Philadelphia Engineers' Club.

Alan H. Reed, merchant and financier, died at his home at Wayne the past month. He was prominently identified with the American Cement Company.

Geo. F. Lasher will erect a $55,000 reinforced concrete addition to his printing plant on Race street.

Civil engineers and construction men generally are very much interested in the San Francisco disaster so far as a study of the buildings destroyed is concerned. A number of the profession will visit the coast to study the ruined buildings. Plans for several of the structures were drawn by Eastern architectural and engineering firms. Locally the opinion is held that most of the reconstructed buildings—especially office, etc., will be of structural steel and reinforced concrete. If so a good demand, in due time, will come from the coast for cement, etc.

QUAKER CITY.

The locating of a Portland cement mill (now under way) at Mason City, Iowa, has inspired ten or more Iowa cities to want a cement plant in their towns. The following named towns are trying to close a contract for one: Fort Dodge, Burlington, Des Moines, Council Bluffs, Marshalltown, Cedar Rapids, Clinton, Keokuk, Sioux City, and the other cities of the first and second class in this state see no reason why they can not also have a cement factory.

Jamestown Cement Stone Company, Jamestown, N. Y.; to deal in sand, cement, etc.; capital, $10,000. Incorporators: Arthur H. Greenland and Emerson A. Gilbert, Jamestown, N. Y.; Charles L. Larder, Buchanan, N. Y.

W. W. Gresham is organizing a company for the establishment of a plant to manufacture cement building blocks, cement bricks, fence posts, etc., at Milford, Va.

NEW YORK LETTER.

So far as the cement business is concerned there is little change to be reported over last month. Sales are good and prices are firm—an advance being predicted if the demand continues. The coal strike is causing some apprehension as grinding must stop at the mills when the fuel supply runs out.

Current quotations on American Portland cement are $1.60@1.70 per bbl.

The building situation continues most satisfactory to engineers, builders, supply houses, etc. In 1905 and thus far this year New York has spent $31,654,540 in building operations (Brooklyn's figures not counted) and the outlook is that the rest of this year additional vast sums will be spent.

The destruction of many large buildings in San Francisco has proven of great interest to local construction and engineering firms. The Geo. A. Fuller Co., a few days after the Pacific Coast disaster, sent an engineer to the coast with instructions to examine especially steel buildings to the end that information could be secured as to their condition after the earthquake shocks. The Thompson-Starret Co. is said to also have sent a skilled engineer for the same purpose. Building engineers here say it is a wise plan to study the buildings of the damaged city in order that in the future earthquake proof structures may be erected. The Thompson-Starret Co. drew the plans for the San Francisco Chronicle building, which withstood the earthquake shocks, but succumbed to the fierce flames. Engineers here express the opinion that New York structures could safely pass through an earthquake visit on account of their construction.

The Hayden Automatic & Equipment Co., 26 Cortland street, report continued good sales of their mixers and block machines. All office hands are busy.

Said a local civil engineer: "There is a strong tendency nowadays to use terra cotta and concrete. Terra cotta gives the fire protection and reinforced concrete the strength."

The Hudson River Day Steamboat Co.'s new office building at Albany will be after the architecture of the Dutch period. The first story will be of bricks, overlaid with cement, and more or less concrete will be used in the structure.

The number of new engineering and construction, as well as concrete companies being formed and incorporated is an indication of the large amount of building and other work that is going on in and about New York. Among the more interesting of these new companies, etc., are: Columbus & Hocking Clay Construction Co., capitalized at $100,000, to manufacture concrete, bricks, etc. J. M. Hartfield, 31 Nassau street, is interested. The Seaboard Bridge Structural Steel Works, 83 Montgomery street, Jersey City, N. J., capitalized at $300,000, to do bridge, aqueduct, etc., work. The D. W. Hills Concrete Co., New Rochelle, N. Y. will manufacture cement and stucco work. Sand Cement Brick Co., Glens Falls. Will make cement blocks, bricks, etc. West Chester Concrete Block Co. Will manufacture cement, lime, etc. Structural Concrete Co., of White Plains. Will do contracting and construction work. Economy Paving & Construction Co., 1222 Broad street, Newark, N. J. Will manufacture fireproof and waterproof materials, artificial stone, etc. Kortgard Concrete Stone Co., 304 Shippen street, West Hoboken, N. J. Will manufacture and deal in real and artificial stone, marble, etc. The New York Engineering Co., capitalized at $100,000; machinery, engineering, contracting and construction. A. C. Ludlam, 21 State street, New York City, is interested. The L. C. Roberts Manufacturing Co., Fillmore, N. Y. Will manufacture a concrete mixer, engines, etc. The Foxhall Brick Co., Passaic, N. J. Will manufacture cement, brick, etc. The John R. Carpenter Co., Jamaica, N. Y. Will manufacture and deal in brick, cement, etc. Capitalized at $600,000.

The Perfection Cement Casket Co. is a newly organized concern at Passaic, N. J., which will, according to claims put forth, deal in concrete tombs and undertakers' supplies. As a matter of fact concrete has been used in many Eastern cemetery vaults, mausoleums, etc., and is growing in favor for burial purposes, being cheaper than marble and serving its purpose as well, according to men who have placed concrete caskets, etc., into actual service.

The Hudson Portland Cement Co., of Hudson, N. Y., on the Hudson river, has good water and rail shipping facilities. New York office in the Park Row building, New York.

A local cement dealer mentioned the fact that white and colored cements were now on the market, which are coming into use to produce decorative effects in building and especially for columns, doorways and concrete exteriors for dwellings. These fancy cements cost a little more than the ordinary Portland cements. They add tone, character and variety to finished work which will broaden the use of cement and removing the monotony common to cement constructions of to-day, which is often desirable.

KNICKERBOCKER.

ARBOREAL DENTISTRY, A NEW USE FOR CEMENT.

Various attempts have been made to arrest the decay of valuable trees. Horticulturists have now and then been successful saving limbs and branches by covering the defective parts with lutes, glue or clay and wrapping with cloth. When the trunk of a tree began to rot at the center and become hollow it was considered hopeless. Now a remedy has been found that will arrest decay and impart new life and vigor to such a tree. It consists in simply filling the hollow, rotting space of the trunk with ordinary plain concrete, just as the dentist fills a hollow tooth. This treatment has been successfully applied to the great oak trees on St. Charles avenue, New Orleans, and similar trees in Audubon Park, in the same city. When the question arose as to what could be done to preserve the great oaks at Audubon Park, which were losing their growth and verdure by reason of big holes in their trunks, and it was accordingly decided to fill the aperture with cement. Several cartloads of sand, mortar and brick were used in the operation, which has been attended with great success. Old oaks regained their strength, new branches began to grow, and altoegther they put on signs of renewed life.

The art of "arboreal dentistry" has since then been perfected to such an extent that even a new bark can be given to a tree. It is proposed at some future date to cover the filling with a layer of cement the color of the oak's bark, which can be so worked as to resemble a natural covering. This will preserve the tree as well as ordinary cement, while at the same time it will add to its beauty by harmonizing in color with the bark of the tree.

There is a Portland cement mill proposition brewing at North Adams, Mass., to use the lime rock and shale found at that place. The North Adams Gas Light Company is interested. The scheme involves the development of a water power plant at Readsboro, on the Deerfield river, in Vermont, from which state a charter has been obtained. Electric power is to be transmitted to North Adams. The power company is to be controlled by the cement plant projectors. There is one serious objection to the establishment of a plant at North Adams, that is the high cost for burning cement, this being the most expensive item in cement manufacture.

REMOVAL NOTICE.

Cement & Engineering News has removed to 22 Fifth avenue, Rooms 504-5 and 6.

HOW TO CONSTRUCT PORTLAND CEMENT SIDEWALKS.

By P. B. Beery.

Some time since the writer compiled the experience of many successful contractors on this subject, and the article published in pamphlet form by *The Cement and Engineering News* seems to fill a long-felt want, inasmuch as no paper exclusively on this subject had previously appeared.

The pamphlet, although somewhat contradictory in substance, due to the different methods practiced, contained many practical and good suggestions, and found a sale to the extent of some ten to fifteen thousand. The following rules are taken in part from that article, and, if followed carefully, should enable the most inexperienced to obtain good results.

CEMENT.

Only the best, well seasoned, slow setting and quick hardening Portland cement should be used. Under no circumstances should natural or puzzolan cements be used, either in combination with Portland or in the concrete course with the intention of using a Portland cement surface.

Natural and puzzolan cements will not stand extreme changes in temperature, and will disintegrate from becoming alternately wet and dry.

The difference in expansion of Portland cement as compared with other cements causes cracks when the two are used together.

A barrel of Portland cement should contain 380 pounds net, or about four cubic feet. One barrel will yield from twenty-five to fifty-five square feet of walk, according to the thickness and proportions in which it is used.

The following table is based on safe proportions for mixing; from it and information following one can estimate the amount of cement required for any specified piece of work:

	Cement	Sand	Broken Stone or Gravel	Thickness	Per bbl.
Concrete course	1	2½	5	3¼ inch	55 sq. ft.
Top course......	3	5		¾ inch	
				4 inch walk.	
Concrete course	1	2½	5	3 inch	50 sq. ft.
Top course......	3	5		1 inch	
				4 inch walk.	
Concrete course	1	2½	5	4 inch	40 sq. ft.
Top course......	3	5		1 inch	
				5 inch walk.	
Concrete course	1	2½	5	4½ inch	30 sq. ft.
Top course	3	6		1½ inch	
				6 inch walk.	
Concrete course	1	2½	5	6½ inch	25 sq. ft
Top course......	3	5		1½ inch	
				8 inch walk.	

"Concrete mixed in proportions of one, two and one-half, and five will require one and one-half barrels cement to the cubic yard and 0.9 barrel if mixed in proportions of one, three, and seven and one-half.

"As to the yield of concrete from various mixtures, no positive rule can be given. It will generally be found that in mixtures in which the sand just fills the voids in the gravel or stone, with cement in the common proportions of one-quarter, one-third, or one-half the amount of sand, the volume of compacted concrete will be about equal to that of the stone or gravel taken. Dykerhoff found that in concrete 1:2:4, 1:3:6, and 1:4:8, the volume of concrete was 10 per cent greater than that of the gravel."

Lake sand weighs about 100 pounds to the cubic foot (not perfectly dry).

Bank gravel weighs about 120 pounds to the cubic foot (not perfectly dry).

Broken stone weighs about eighty-five pounds to the cubic foot (limestone).

Portland cement weighs about ninety-five pounds to the cubic foot (loose).

MATERIALS.

"Dirty sand and gravel, even under an expert operator, will cause work to crumble. Cement will not adhere to dusty and dirty material. If such is used, work will be weak and of short life."

In all cases clean, sharp sand and clean gravel, broken stone or granite should be used. Clay or loam in the sand will cause sidewalk to be discolored or have a streaky appearance.

Recent tests prove that 10 to 12 per cent of finely ground dry clay added to concrete will materially increase its strength. No increase of strength, however, will overcome discoloration.

WATER.

Results of experiments with wet, medium, and dry concretes prove that a very wet mixture will be slow in attaining its full strength, but will become stronger in age than medium or dry mixtures, while the reverse is true of the dry mixture.

Enough water should be used in concrete or bottom course to make mixture plastic and quake like jelly when tamped.

In surface coat use only such an amount of water as will allow finishing to be done in not to exceed thirty minutes. Too little water will impair the strength of concrete.

FORMS.

After the grade for walk has been established and excavating for artificial foundation is done, 2x4 strips should be fixed rigidly and at both outer edges of the walk, not only to keep the work true, but in order that the surface coat may be graded by working a leveler over the work, using the strips composing the form as a guide. These 2x4 strips can be held in place by being nailed to stakes driven in the ground. They can be removed after the work has thoroughly set. When constructing cross-walks, it is well to leave them in place, as they protect the edges of the work.

FOUNDATIONS.

When there is not a natural drainage or where ground is not sandy, before laying walk one should excavate to the depth of from ten to twelve inches. Six to eight inches of this excavation should be filled with broken stone, coarse and fine gravel, or cinders and sand. This material should be wet several times and thoroughly tamped to avoid settling after walk has been laid over it. It is also well to run drain tile from the foundation to carry away water that may accumulate and freeze, otherwise the expansion of that water when freezing will crack the work.

PROPORTIONS.

All proportions should be based on measure, not weight. The use of the same proportions of cement sand and gravel or broken stone or granite with different materials will not always give good results. One can obtain dense and compact work only by determining the voids in the materials to be used, and by using them in the proper proportions.

Following is an abstract from an article on concrete by S. B. Newberry, which gives a simple method of determining voids:

"The first consideration in preparing concrete is to combine the materials in such proportions as to produce the greatest possible density. This is accomplished by using just enough of the finer material to fill the voids in the coarse material. The percentage of voids in the latter should be in all cases carefully determined. This is most simply accomplished by the use of a metal box of exactly one cubic foot capacity. This is filled with the material to be tested, well shaken down and struck off level and weighed. Water is now poured in at one corner until it rises even with the surface, and the weight is again taken. The difference is the weight of water filling the voids of the material. Now one cubic foot of water weighs 62.4 pounds, and from the weight of water found the percentage of voids can be simply calculated.

For example, in one experiment the box and broken stone weighed 88 pounds. After filling the spaces with water the total weight was 117½ pounds, a difference of 29½ pounds. The percentage of voids was therefore 29½×100÷62.4=47.3.

In the case of sand this method will not answer, as it is difficult to completely fill the voids of the sand by adding water. The voids can, however, be readily calculated from the weight of a cubic foot and the specific gravity. The specific gravity of quartz sand is 2.65. A cubic foot of sand, free from voids, would therefore weigh 2.65×62.4=165.4 pounds. The weight of a cubic foot of sand well shaken down was, however, found to be only 112 pounds, a difference of 53.4 pounds. The proportion of voids was therefore $53.4 \times 100 \div 165.4 = 32.3$ per cent.

Sand with round grains is superior to that consisting of irregular fragments and splinters, since it compacts more closely and contains a lower proportion of voids. As to fineness, the sand is best which contains the greatest variety of sizes, from the finest to the coarsest grains. All the materials used should, in fact, show a regular progression in size of grains, from the finest dust of the cement through the finer and coarsest particles of the sand to the largest fragments of gravel or stone. Only under these conditions can the maximum density and strength of the concrete be obtained.

The calculation of the proportions in which the materials are to be mixed is as follows:

Let us assume a sand with 32.3 per cent voids and gravel with 35.9 per cent. To fill the voids in the gravel with sand, we shall require 35.9 volumes of sand to 100 volumes of gravel, or 1 to 2.8. To fill the voids in the sand with cement we shall require 32.3 per cent of 35.9, or 11.6 parts by volume. The theoretical proportions will then be, cement 11.6, sand 35.9, gravel 100, or 1 to 3.1 to 9.6.

Similar calculations will show that with the cement, sand, and broken stone showing 47.3 per cent voids, the theoretical proportions will be 1 of cement to 2.13 of stone, and of cement, sand, and stone, 1 to 3.1 to 6.5.

It is a common practice to increase the proportion of mortar more or less above that calculated, to compensate for imperfect mixing or to obtain concrete of greater strength. This, however, is an error. There is *one proportion*, and only one, in which a given sand and stone can be mixed and give the minimum of voids. This is the proportion in which they should always be mixed, whether a rich or poor concrete is required. Mr. Wm. B. Fuller states the following rule:

"Mix the sand and stone (or gravel) in a definite fixed quantity, as determined by experiment for the material in use; then add cement as economy indicates, possibly up to 10 per cent in excess of the voids in the combined material."

Returning to our calculation of the proportions of a theoretically perfect concrete, we found that the mixtures, cement 1, sand 3.1, and gravel 8.6, and cement 1, sand 3.1, stone, 6.5, fulfill the conditions that the voids in these particular coarse materials shall be completely filled with cement. These may seem like poor concretes, but, in fact, they are extremely good, and will show a crushing strength of over 2,000 pounds per square inch at twenty-eight days. The secret of their quality is, however, the *correctness of the proportions,* and a small variation in the relative amounts of sand and gravel or stone will convert them into poor and inferior concrete, even though the proportion of cement be not changed. To improve the strength still further, perhaps even to 4,000 or 5,000 pounds per square inch, the cement only should be increased. Simultaneous increase of the sand would defeat the purpose in view, and would weaken the concrete, perhaps as much as increase of cement would strengthen it. It should be remembered that a properly proportioned concrete, 1 to 3 to 8½, is stronger than a cement and sand mixture 1 to 3. One barrel of cement in judicious admixture with sand and gravel is therefore as good as three barrels with sand only. No more need be said to make clear the necessity of careful and scientific methods in the specification of concrete mixtures."

MIXING.

Never use a mix after it has begun to set; the strength of the cement is impaired if it is disturbed while setting. Cement and sand in all cases should be thoroughly mixed before and after water is added. After mixing and before wetting, sand and cement can be sifted to obtain uniform mix.

Poor mixing causes poor work, irregular finish, sandy and rough surface, and makes walks weak and wear poorly. Poor mixing is the principal cause of failure and poor results. Where the quantity of work to be done will warrant it, mechanical mixer should be used; there are several comparatively cheap machines on the market which do the work more thoroughly than it can be done by hand, and for less cost, to say nothing of the more uniform and high class work obtained.

Sand and gravel or stone should be mixed so thoroughly that all are covered with a thin coating of cement. Sand, gravel, or stone should be damp (not wet), so cement will readily adhere to all particles. It is good practice to apply water with sprinkler and not wash the cement out of the mix.

SEPARATING BLOCKS AND MAKING JOINTS.

The majority of contractors prefer to use steel plates or strips three-sixteenths to one-quarter inch thick and remove them just before final finish and joint is made. In some cases blocks are laid alternately. Good results can be obtained by cutting the concrete course to the width of one-half inch and finishing the top coat into the cut to the depth of one to two inches, cutting with trowle through both to separate blocks when finished. Such cuts will not close if the work is done with mixes that are not too wet.

If sand is used to separate blocks, use a joiner that leaves an open seam, with edges well rounded, and after running the joiner draw a trowel through so the seam is open to the sand. Great care should be taken in separating blocks completely, as it provides for any expansion in the cement and overcomes the possibility of work cracking, due to freezing and expanding of water in foundation or from the growth of tree roots, etc. Joints that are not made continuous are apt to run into the next block. A block laid around a post will crack unless joints are provided.

CONCRETE OR BOTTOM COURSE.

Use as coarse sand as can be had, even to the finer gravels, for concrete purposes, and in connection with the broken stone or granite. Varying size grains of sand yield stronger concrete than sand all of one size, as the smaller fill the voids of the larger. Broken stone or gravel should be washed if dirty or dusty. The dry sand and cement should be mixed thoroughly, then wetted and mixed again. (See Mixing.)

After the broken stone or coarse gravel is dampened, the above mentioned mortar should be added and all thoroughly mixed.

After noting these precautions the concrete for bottom course can be placed in the form and the next important operation is the tamping. Don't lay more bottom course than can be promptly covered with top coat, otherwise top and bottom courses will not adhere.

TAMPING.

As previously stated, concrete course should be tamped until moisture appears on the surface. Good results cannot be obtained unless work is thoroughly tamped. By so tamping the operator comes nearer producing an artificial stone—i. e., the mass becomes dense and will not sound hollow or go to pieces under strain. Insufficient tamping makes work porous and weak; such work will crack and break after first frost.

The surface coat should also be tamped to the concrete course, but only to such an extent as will work out air bubbles between the layers and enable them to adhere truly. Too much tamping of surface coat will cause neat cement to work to the surface and this causes hair cracks. The best operators do the tamping necessary to top coat with the leveler and trowel, when the work is being brought to a true surface and while it is being finished.

TOP OR SURFACE COAT.

Use only fine, clean, sharp, sifted sand for top coat. Mix sand and cement thoroughly. (See Mixing.)

Lay surface coat before concrete course has set, otherwise you will obtain two walks instead of one, for top and bottom courses will not unite, and in time top will go to pieces. The hollow sound noticed when walking over some work is due to the two courses not being united. Top and concrete courses will not unite if mix is too wet or if they are not properly tamped together. Some contractors instead of tamping on top coat put it on in two layers and have their finishers *press* the course down well under the trowel. If too much water is used in top coat, too much neat cement will be brought to the surface in troweling, and that will cause scaling, haircracks, and checkered appearance, as well as a smeary and streaky looking job. Use just enough water in top so that after tamping it will strike off, float and trowel easily. Top should be finished within thirty minutes after being mixed and laid. By not using enough water in top mix, too much troweling will be required and work spoiled.

TROWELING.

Overtroweling brings too much neat cement to the surface, and causes top to wear rough; when the thin skin of cement so brought to the surface is worn or scuffed off, the top will become powdery and the sand in the mix will gradually work loose and show wear. The so called skin will come off in spots. One should trowel only sufficiently to obtain a smooth surface or use trowel for smoothing only.

If surface coat is finished within thirty minutes after laying there will be plenty of moisture left, and the danger of overtroweling and hair cracks will be avoided. "Most of the troweling should be done with a float." If top is mixed too wet it will need extra troweling, and the defects will then surely appear.

Insufficient and improper troweling will cause rough surface, pock-marks, unfinished appearance, and pimples. The latter are due to the air which is not worked out of the mix. Insufficient troweling causes blisters under the surface. The pitted surface in some cases is from the sand working loose, due to cement and sand not having been thoroughly mixed.

If top is well mixed, insufficient troweling will not occur.

To dust neat cement on top coat before finishing is poor practice, as it causes hair cracks and checking, in some cases, the same as overtroweling. It makes the walk too slippery. The top coat will wear off easily and become rough, owing to the skin of neat cement which forms as in work overtroweled. Such work will appear black and cloudy. Dusting is sometimes practiced when work has been mixed too wet and when a contractor does not wait long enough for top to dry out sufficiently to be finished. Dusting with neat cement to absorb surplus water should not be practiced. Instead mix cement and fine sand dry and sieve on surface, then finish. Some unreliable contractors dust, and by so doing give the appearance of a surface mixed in proportions of one part cement and one part sand. In reality they have put on a top of one to four.

WET THE WALK AFTER CEMENT IS SET.

In warm weather sidewalks should be kept wet from three to five days after cement has set. Would suggest, however, that water be applied in morning and evening, at least not when the sun is on work. This assists the cement to attain great strength, and will cause the work to bleach.

SIZE OF BLOCKS.

Size of blocks into which work is cut should depend on width and thickness of walk. To make work look symmetrical and to allow for expansion, also to guard against cracks, the following rules may be followed:

4 inch work, 5 foot walk, cut 4x5 or 5x5.

4 inch work, 6 foot walk cut 5x6 or 6x6.

4 inch work, 8 foot walk cut 4x4.

5 inch work, 8 foot walk cut 8x8.

6 inch work can be safely cut 8x10 to 8x14.

Good results have been had with blocks cut as large as 14x25 feet, but 8x10 or 12x14 should be the limit.

The thickness of the walk should be increased as the size of the block increases.

THICKNESS OF WALKS.

Four inches of concrete is recommended for ordinary work, but the thickness of the work should be varied according to conditions. In residence sections it is customary to put in work with three and one-half inches of concrete or bottom course, and one-half to one inch top. In business sections four and one-half to five inches of concrete and one inch surface coat.

Following rule, for thickness, can be followed:

5 foot walk, 3½ inches of concrete and ½ inch top.

6 foot walk, 5 inches of concrete and 1 inch top.

7 foot walk, 5½ inches of concrete and 1 inch top.

8 foot walk, 7 inches of concrete and 1 inch top.

9 to 10 foot walk, 7½ inches of concrete and 1½ inch walk.

COST.

The cost of sidewalk work, of course, varies, as does the cost of the materials and labor used in its construction. As to labor, it is safe to figure about eighteen square feet per man per hour. For guaranteed four inch walk one should expect to pay not less than 13 cents per square foot; such a price will leave only a moderate profit to the contractor, who has to figure on delays on account of weather, losses, etc.

The property owner can generally get a walk put in at his own price if he figures with contractors who are not responsible. For his benefit the writer would say that it is cheaper in the end to patronize an experienced man who has one price for his work and is not figuring on skinning out on the amount of cement to be used and on slighting the work by poor mixing and tamping.

COLORED WORK.

The strength of work is not affected by coloring if the best metallic oxides, free from sulphur, are used. Never use Venetian red or lampblack, as they run and fade. The following rule is recommended.

Black, use 2 per cent Excelsior carbonate black.

Red, use 10 per cent best raw iron oxide.

Brown, use 6 per cent best roasted iron oxide.

Buff, use 10 per cent best ochre.

Blue, use 6 per cent ultramarine.

For as near white as possible, use marble dust or white sand.

PROTECTING WORK FROM SUN AND FROST.

It is to be remembered that if walk work is allowed to freeze, the surface will scale off. To protect work from frost, tarpaulin and clean sawdust and shavings should be used. Cover should not be removed short of two or three weeks, or until work has thoroughly dried out. In cold weather use as little water as possible, and have it moderately warm. Also see that sand, gravel, or stone is warm. In hot weather walk should be protected from direct rays of the sun. Work should be covered by canvas, on frames (which are transportable), made in sections. Sun baked work has the appearance of glaced or overburned clay, and will from this cause show small cracks like those in dried mud.

USE OF SALT WATER IN FREEZING WEATHER.

The writer has always found one pound salt to four gallons of water recommended, which would figure twelve and one-half pounds salt to fifty gallons of water. As the effect of salt in cement is to make it quick setting and to decrease its strength to some extent, it would follow that as little as possible should be used. Mr. S. B. Newberry, who is a recognized authority, says: "I know of many cases in which salt was added to cement for use in freezing weather without bad results. I think, however, that there are some objections to its use, and that it can safely be dispensed with." He quotes from "Portland Cement and Its Applications" (in German), published by the Portland Cement Manufacturers' Association: "In cement work to be executed in freezing weather, the addition of salt to the mortar has been recommended and used. Such an addition, however, is not only superfluous but even injurious, since it causes unsightly efflorescence (white incrustation) on the work. If compelled to do cement work in very cold weather, it is preferable to heat the water and sand and use little water, in order to accelerate the setting of the mortar. If one is careful not to allow any free water to separate out, or to absorb this water with dry stone, there is scarcely anything to be feared from the action of heavy frost, and the use of salt may be dispensed with."

CEMENT SIDEWALK TILE—WINTER INDOOR WORK.

At many northern points, as at Minneapolis and St. Paul, cement sidewalk tile for light wear are made indoors during the winter months and laid in the summer. This practice is good, as it gives walk masons continuous work. The tiles so made measure 2x2 feet, and are 2½ to 3 inches thick; made in proportions of one part cement to three parts sand. These tiles are laid on good cinder and sand foundations, and can be leveled as are stone flags, should the foundation settle.

SPECIFICATION.

Following is the Indianapolis city engineer's specification for sidewalks. Same might well be adopted by all cities:

1. Stakes will be set by the engineer to define the line of one edge of the walk, and the grade marks will indicate the top of the walk at said line. The transverse slope of the walk will be one-fourth inch per foot, and will be determined with level and grade board made according to drawing in engineer's office.

2. The sidewalk shall be graded to the width as shown on plan for the entire length of improvement, including all wings and crossings, as shown on plan, and sixteen inches below the finished surface of the walk. The grading must be smoothly and neatly done, all large stones, boulders, roots, sods, and rubbish of every description being removed from the grade, and the entire work must be made to conform fully to the profile and the grade of the walk when finished. Soft, springy, or loamy spots in the sub-grade must be taken out and refilled with good material, and the grade solidified by ramming.

3. Trees shall not be injured, cut down, or otherwise disturbed except by order of the engineer. Roots of trees which are not removed, but which are contiguous to the line and grade of the walk or in any way interfere therewith, must be trimmed and cut away as the engineer shall direct, and where the engineer directs the stones shall be fitted to the trees and roots covered with earthenware half-pipes. Any tree removed must be grubbed for the entire width of the sidewalk, and also all its roots that rise above the level of the subgrade. No extra compensation for such work will be allowed.

4. Upon the sub-grade thus prepared and after inspection and acceptance of the same, a foundation of sand and fine gravel or broken stone, in such proportions as, when rammed, will form a solid and compact mass, shall be spread to a uniform depth of twelve inches, all to be rammed and tamped until it presents a hard, smooth surface. It shall be sprinkled with water as required, enough remaining to render the surface as moist as the concrete at the time the latter is laid.

5. Wooden frames four inches in height will be placed in the manner necessary to outline both external edges of the walk accurately, the top of the frames being located to coincide with the established grade of the walk.

Gauges must be used to render surface of foundation layer and of concrete parallel to the top of the walk.

Concrete will be made as follows: One measure of Portland cement as hereafter specified for sidewalks, and two measures of clean, sharp sand or granite mixed thoroughly, while dry, and then made into mortar with the least possible amount of water; broken stone or gravel not over one inch in any dimension, thoroughly cleansed from dirt and dust, and drenched with water, but containing no loose water in the heap, will then be mixed immediately with the mortar in such quantities as will give a surplus of mortar when rammed. This proportion, when ascertained, will be regulated by measure.

The engineer may accept a clean, natural mixture of sand and gravel if it is uniform and contains no dirt, sticks, or stones larger than above specified. The proportions will be one part of cement to five parts of the mixture. Each batch of concrete will be thoroughly mixed, and the engineer may prescribe the number of times it shall be turned over, wet and dry, to accomplish this result. In general it shall be turned (or cut) four (4) times dry and three times wet. It will then be spread to fill the frames even full and be at once compacted thoroughly by ramming until free mortar appears on the surface and until one and one-fourth (1¼) inch gauge, furnished by the inspector, shall pass over the concrete. It is the intention that the surface of the concrete, when thoroughly rammed, shall be at least one and one-fourth (1¼) inch below the top of the frame. The whole operation of mixing and laying each batch of concrete will be performed as expeditiously as possible.

6. After each batch of concrete is laid, as required, it shall be immediately covered with the wearing surface. Any portion of the foundation which has been left long enough to have any appearance of setting shall be taken up and relaid before the top is put on, and under no circumstances will concrete be allowed to remain over night before top is put on. The wearing surface or top shall be composed of one part of the same cement used in the concrete and one part of clean, sharp sand, thoroughly mixed dry and made into mortar with the least possible amount of water. It shall be evenly and compactly spread to the finished surface of the walk and made smooth and even by troweling and floating. The top and concrete foundation must be cut into blocks of dimensions approved by the engineer. The pavement shall be properly fitted around all fixtures in the sidewalks, the edges of the pavement to be beveled from top surface to bottom of concrete with the material used on the top.

When finished the work shall be kept covered from the sun for three days and kept moist by sprinkling until thoroughly set.

7. Coloring matter of quality and quantity approved by the engineer will be required for the top surface. (Lamp black is used in Indianapolis to darken surface coat, in that way overcoming the reflection of sun's rays in tiring the eyes.) On business streets the engineer may require the surface to be carefully rolled with a toothed roller when the finish is completed. (This is to keep walk from being too slippery.)

8. When a driveway occurs in the line of the walk, the walk will be increased in thickness and laid according to plans furnished by the engineer.

9. All blocks accepted shall be perfect and of good quality in all respects, free from cracks, warps and similar imperfections. Special care shall be taken to protect walk at night.

If found not to comply with the specifications in any respect at any time up to the end of the guarantee period, they shall be taken out immediately and replaced by the contractor at his own expense.

All disfigured walks shall be taken up and replaced by the contractor at his own expense.

P. B. Beery.

Sandusky, Ohio, March, 1906.

The Superior Portland Cement Company, Jackson, Ohio; M. L. Sternberger, J. McGhee, S. A. Sternberger, D. J. Herbert and Frank Crumit; capital, $10,000.

REMOVAL NOTICE.

Cement & Engineering News has removed to 22 Fifth avenue, Rooms 504-5 and 6.

FROST RESISTANCE OF POROUS BRICK.

The prevailing idea that porus brick will not resist the action of frost when saturated with water is not borne out by actual tests, as shown by the following table prepared by the Imperial German Technical Testing Laboratory for Building Material at Charlottenburg.

The tests were made on ten bricks, and the results are the average of the obtained data. These tests represent twenty-five times freezing and alternate thawing. In order to determine the frost resistance the bricks were subjected to a compression test, and the percentage resistance was figured from the same. To make the results plain the bricks were arranged in order of their percentage absorption, and in case there is any relationship between porosity and frost resistance the last columns should maintain the same ratio as the absorption column. It is evident from these results that these two qualities do not have anything in common. Increased absorption does not always mean less frost resistance. There are a few exceptions, but the main results are very irregular. No. 2, a nearly vitrified brick, shows the least frost resistance. No. 8 and No. 16 also show great variations. The results in the lowest part of the table are very interesting, as it shows high porosity and high frost resistance. Rather remarkable is the increase in compressibility after freezing in several cases.

No.	Kind of brick.	Absorption per centage.	Compression. Before freezing.	Compression. After freezing.	Perentage. loss of stability.
1.	Buff face	1·32	687	667	— 2·9
2.	Paving	2·41	764	419	— 45·2
3.	Paving	3·31	455	432	— 5·1
4.	Face	3·50	465	411	— 11·6
5.	Face	4·10	1197	1136	— 5·1
6.	Hardburnt	4·70	508	431	— 15·2
7.	Buff face	4·98	375	358	— 4·5
8.	Face	5·63	706	517	— 26·8
9.	Paving	5·80	342	280	— 18·1
10.	Face	6·80	227	215	— 5·3
11.	Red Face	6·84	484	469	— 3·1
12.	First-class paver	6·90	452	411	— 8·9
13.	Common	7·70	308	314	+ 1·9
14.	Face and paving	7·82	444	488	+ 9·9
15.	Common	8·17	206	211	+ 2·4
16.	Backing-up	8·30	349	270	— 22·2
17.	Common	8·30	127	103	— 18·9
18.	Sewer	8·41	439	354	— 19·4
19.	Common	8·50	252	246	— 2·4
20.	Face	9·22	374	383	+ 2·4
21.	Common	9·94	554	423	— 23·7
22.	Machine paver	10·60	229	232	+ 1·3
23.	Common	10·80	397	271	— 31·8
24.	Face	11·10	331	310	— 6·3
25.	Common	11·58	237	227	— 4·2
26.	Backing-up	12·24	271	205	— 24·3
27.	Face	12·29	251	237	— 5·6
28.	Face	12·48	384	315	— 17·9
29.	Arch	13·20	189	180	— 4·7
30.	Common	13·30	85	74	— 12·3
31.	Common	13.46	268	277	+ 3·3
32.	Machine	13·60	369	360	— 2·4
33.	Common	13·70	207	196	— 5·3
34.	Buff face	15·16	596	614	+ 3·0
35.	Backing-up	16·31	249	310	+ 24·4
36.	Backing-up	18·85	263	240	— 8·8
37.	Machine	19·54	218	201	— 7·8
38.	Machine	19·70	389	356	— 8·5
39.	Backing-up	22·40	166	172	+ 3·6
40.	Backing-up	24·11	105	101	— 3·8

There has been much said about the porosity of concrete, especially of the concrete building block not standing up under the action of frost. It is a well known fact that concrete possesses greater strength than the common and medium grade brick, therefore if common and medium brick resist the action of frost, as shown by the above table, why should not the concrete block do the same. We have yet to learn of a single failure due to frost in a well made concrete block after it has been thoroughly cured. Ordinary monolithic concrete masonry mixed 1 to 10, is not effected by frost at 15 F. below zero.

The damage case of Patrick Higgins vs. the Peninsular Portland Cement Company of Jackson, Mich., tried in the circuit court, has resulted in a verdict for Higgins, placing the damages at $1,000. The plaintiff asked for $10,000 for the loss of a portion of a hand in machinery at the company's plant.

REMOVAL NOTICE.

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INCORPORATIONS.

Southern Artificial Stone Company, Shelby county; capital, $5,000. Incorporators, W. B. Hoffman, T. C. Ashcroft, G. M. McCormick, Henry Caro and J. Guy Moyston.

Philadelphia, Pa.—The Interstate Cement, Brick and Block Company was incorporated, with a capital of $10,000, to manufacture cement, brick and cement blocks. M. C. Carey, F. N. LaPierre and G. F. Brinton incorporators.

Cement Products and Construction Company, Braintree, Mass., $50,000; Helen C. Evans, Charles A. Miller, Susan R. Greenan.

Davenport, Okla.—The Davenport Concrete Company has been organized here for the purpose of making concrete blocks for building. It is capitalized at $5,000. The promoters are C. C. Randel, T. S. Watts and A. J. Langer.

Articles of incorporation will be filed by the Racine Hollow Wall Concrete Company, with a capital stock of $6,000. The incorporators are F. Arthur Morey, Henry A. Hoernel and Fulton Thompson.

The Coplay Cement Manufacturing Co. has elected the following board of directors: Thomas J. Brady, Jos. L. Berg, James Butler, G. Blum, Ralph Blum, W. H. Harding, Samuel G. Heebner, Penrose Fleisher, S. H. Bachman, Ferdinand L. Loeb, Lyman Sonn, Robt. L. Morrell, Abraham Israel, F. J. Geiger and Charles M. Saeger.

Greensboro — Concrete Works — Chartered: W. R. Pleasants Concrete and Paving Company, with $10,000 capital stock, by W. R. Pleasants, Garland Daniel and W. D. Marrow, all of Greensboro, N. C.

E. L. Osgood, J. G. Newton, J. A. Brown, W. T. Grace and W. W. Pendleton have organized the South St. Joseph, Mich., Cement Stone Manufacturing Company for the purpose of making cement stone for building houses, retaining walls and foundations.

The Union Portland Cement Company of Ogden, Utah, has closed contracts for electric machinery with the Western General Electric Company and Fort Wayne Electric Company, ball and tube mills with F. L. Smidth & Co.

The Janesville Cement Post Co. has contracted with the Chicago & Alton Railway to deliver sixty cars of cement posts before December 1st, divided as follows: 30,000 line posts, 600 corner posts, 680 intermediate posts, 35 mile posts, 150-rail posts and 75 whistling posts, to be used in fencing the company's right of way on its new line between Springfield & Murryville, Ill.

CASSADAGA CEMENT WORKS TO BE SOLD.

The Cassadaga cement works, now owned but not operated by the Continental Cement Company, are about to enter upon the third chapter of their history. It is to be hoped that before the turning of the final leaf of this chapter the dark days may be past and the real merits of the proposition come to the front and success be achieved.

The financial and other trouble of the Continental company—its unpaid debts, liabilities to employes, mechanics' liens, etc.—long have been known. The entire property is soon to be sold at mortgage foreclosure at the offices of Nugent & Heffernan in Dunkirk to satisfy the claims of creditors, bondholders and others which have accumulated to large proportions. The plant has been idle for many months.

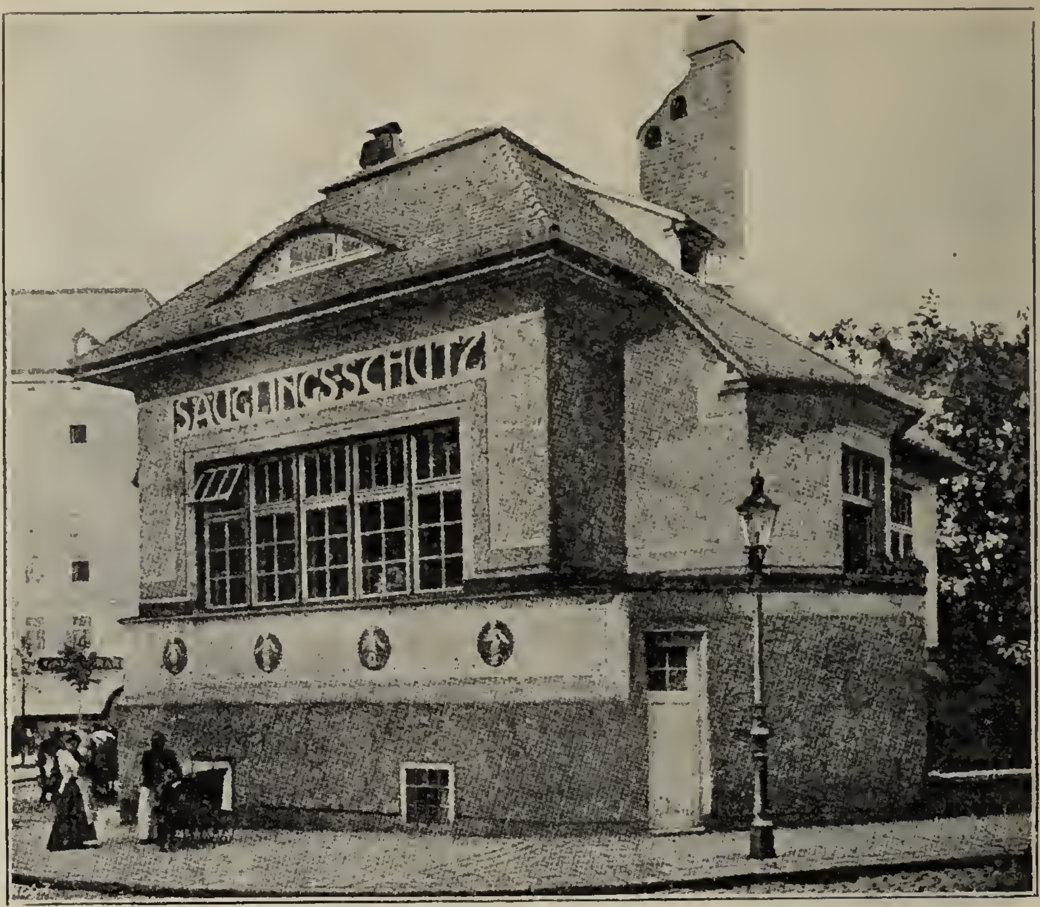
It is said that the real source of the troubles has been the failure to harmonize the Canadian interests which became identified with the company at the reorganization of the old Frank Shaw company three years ago and the American interests which remained in at that time. Buffalo, Jamestown, Akron, Erie (Pa.), Bergen (N. J.), Rochester and Dunkirk men are interested. It is expected that at the foreclosure sale the two groups of capitalists will be found ranged in opposing parties, and a lively time may follow.

The property includes the plant, marl and clay beds in the Cassadaga swamp on the line of the D., A. V. & P. railroad near Cassadaga depot, and a large plant including a short railroad, dredges, laboratories, kilns, grinding and mixing machines, dry rooms and storage. The company was promoted and organized and the buildings erected by Frank Shaw of Moon's Station over ten years ago. It gave promise of becoming a very successful industry. The present foreclosure is the result of actions brought for creditors, including employes and bondholders, by Nugent & Heffernan.

The new plant of the Sandusky Portland Cement Company to be erected at Dixon, Ill., will be larger than either its Sandusky or Syracuse plants. W. E. Wuerth will superintend the construction for the company. Mr. Wuerth is now on the ground arranging to commence work, which is to be pushed with vigor. Machinery is to be installed for 200 barrels per day, while the buildings will be of sufficient size to produce 4,500 barrels per day, for which capacity machinery will be installed in the future.

REMOVAL NOTICE.

Cement & Engineering News has removed to 22 Fifth avenue, Rooms 504-5 and 6.



Infants' Shelter, Vienna, Austria.

CONCRETE BUILDING, VIENNA, AUSTRIA.

We illustrate a handsome concrete building erected in one of the public parks of Vienna, Austria, designed by Fr. Ohmann, of the same place. Herr Ohmann has the reputation of being one of the leading architects in Europe to-day. The building is known as the 'Sauglings Schutz," or infants' shelter.

The Peerless Portland Cement Co. has been reoganized. The capital stock of the company has been increased from $250,000 to $830,000. The word "The" in the title of the old company has been dropped.

The following officers were re-elected, as follows:

President—A. W. Wright, Alma.

Vice-President—S. O. Bush, Battle Creek.

Secretary and Treasurer—W. M. Hatch, Union City.

Manager—J. R. Patterson, Union City.

Directors—A. W. Wright, S. O. Bush, W. P. Knowlton, J. R. Patterson, W. M. Hatch.

The company had a prosperous year in 1905 under the management of J. R. Patterson. The outlook for the coming season is extremely favorable.

The financing of Portland cement plant to be erected at Epps, Ala., is said to have been successful. This makes the third cement plant organized within a year in Alabama, one being at Leeds and the other at Ragland, all in the vicinity of Birmingham.

Burlington, Iowa, citizens are urging the Commercial Exchange Association to take up and push the organization of a company to build a cement mill. The local press of the city claim that limestone and clay are found in large quantities near the city suitable for the manufacture of cement.

The board of works is reported to have awarded to the Lakefield Portland Cement Company of Lakefield, Ont., the contract for supplying Hamilton, Ontario, with Portland cement at $1.77 per barrel of 350 pounds, f. o. b. cars Hamilton. Bags to be charged at 10 cents each and credited at same figure when returned to works at Lakefield, freight prepaid.

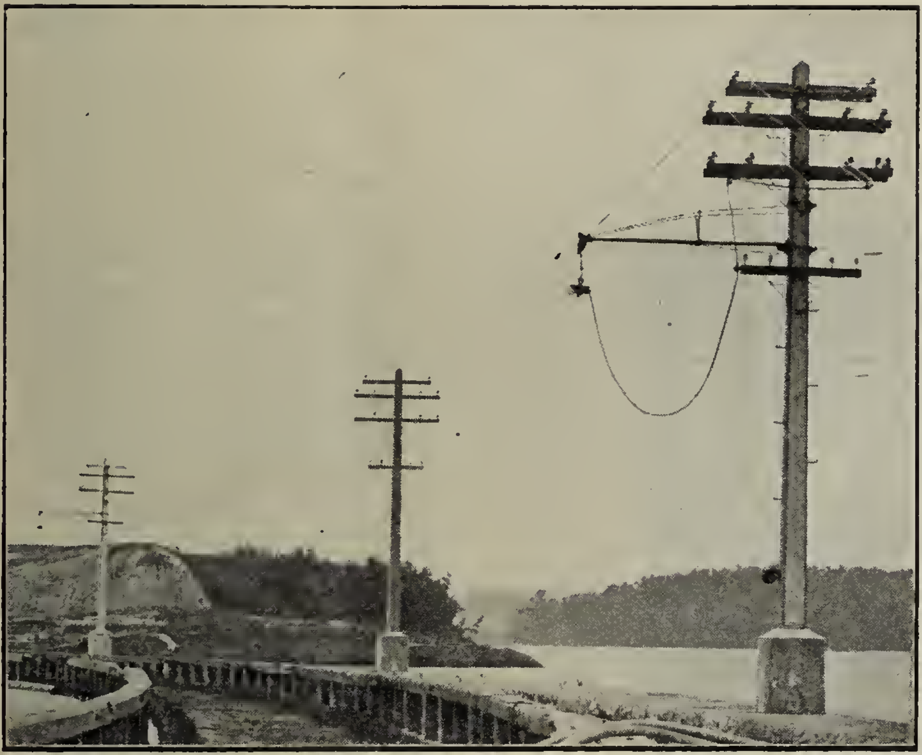
CHINESE CEMENT FOR THE PHILIPPINE RAILWAYS.

The U. S. government is constructing 400 miles of railways in the Philippine Islands through Luzon, Panby, Negros and Cebu islands. Steamship lines will form the connecting link between the islands' railway terminals, thus affording a continuous line of transportation from the extreme north to the extreme southern islands. All construction materials used on this line will originate in the United States except the cement, which will be furnished by the Queen Island Cement Co., which operates a modern rotory kiln plant, including several shaft kilns, erected before the rotory kiln process came into use. The company's works are located on an island in the Pacific ocean off the coast of China, about 630 miles northwest of Manila. With water transportation from its mills direct to Philippine ports, it can lay down cement for the above work at prices below all competition.

REINFORCED CONCRETE POLES.

The numerous Canadian electric power transmission companies converting water power into electrical energy, which is being distributed to various commercial centers over thousands of miles of territory, requiring large quantities of poles. The cedar post which a few years ago were easy to obtain are now growing scarce. The heavy wire required for economical electrical transmission call for very close setting of the poles. This again increases the number of cross arms and insulators. It will be seen that strong poles will insure a considerable saving.

Various kinds of steel poles have come into use, conveying spans as long as 400 feet. While steel poles have the required strength, they are costly and require considerable expense in maintenance. While steel towers, with a wide and considerable base and have been used on account of cheapness, they are objectionable because they take up considerable room on the right of way. They likewise require considerable care and are short lived on account of the light material.



Reinforced Concrete Poles.

A reinforced concrete pole is now being introduced by J. L. Weller, superintending engineer of the Welland Canal. The first experimental pole of this construction was a failure on account of defective reinforcement. After several failures the proper construction was obtained. Nearly one hundred poles are now in use on the Welland Canal electric transmission line. The line was equipped with cedar poles, all 35 feet high, before the reinforced concrete pole was perfected. The concrete poles are now installed only where extra high poles are required.

DETROIT PORTLAND CEMENT LITIGATION.

A petition for leave to intervene in the case of Rene E. Paine against the Detroit Portland Cement Company of Fenton has been filed by T. L. Backus, C. A. Stringer, L. J. Kretzshmar, Edward Strange and C. F. Backus of Detroit and L. E. Becker of Fenton, Mich.

The petitioners allege that Paine is merely a "dummy" in the suit instituted some time ago against the cement company, ostensibly to foreclose a mortgage for $400,000, and that his attorneys are acting in conjunction with a New York attorney.

The petitioners intimate that the suit is a move on the part of a large stockholder of the company in the east and that there is something more to the case than appears on the surface.

New York capitalists are negotiating with land owners west of Annville, Pa., for the purchase of several farms carrying limestone suitable for the manufacture of cement, with the view of erecting a cement plant.

The Bessemere Contracting and Ballast Company of Pittsburg, Pa., will erect a $40,000 plant on the Youghiogheny river, to manufacture railroad ballast and macadam, having contracted for the slag output of the National Tube Company. The company has several patents and charter of another company recently organized with a capital of $150,000 and will manufacture cement sewer pipe and concrete railroad ties.

REMOVAL NOTICE.

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CEMENT BLOCKS.

The Missoula Cement and Concrete Company. The incorporators are John M. Lundgren, W. H. Houston and J. E. Wilson of Missoula, Mont. The capital stock is $10,000.

I. Roberts will make cement blocks at Wichita Falls, Tex.

The Central Concrete Construction Company, Louisville, Ky., has filed articles of incorporation with a capital stock of $25,000, divided into $100 shares. The limit of debt is $100,000. Incorporators and their holdings are: Robert C. Morris, thirty shares; Arthur Kaye, thirty shares; Taylor B. Brown, thirty shares; P. S. Hudson, thirty shares, and C. J. Meddis, thirty shares.

The Art Concrete and Construction Company, Evergreen, N. Y., was incorporated with a capital of $20,000 to manufacture concrete, concrete facings, blocks, etc. P. Stier, Evergreen, F. J. Mason and F. H. Mattlage, Brooklyn, are the incorporators.

The Cement Product and Construction Company, Boston, was incorporated with a capital of $50,000. H. C. Evans, president, Boston; C. O. Miller, treasurer, East Braintree, Mass.; S. A. Greenan, clerk, Boston.

A charter has been granted the Frankford Cement Stone Company, Philadelphia, Pa. Capital, $15,000. W. H. Hunter, treasurer.

The Fillmore Concrete Mixer Company, Fillmore, N. Y., has been organized with a capital of $20,000 to make concrete mixers and other cement working machines. A factory will be built at once.

WEALTH IN THE CEMENT INDUSTRY

Prof. E. H. Barbour of the University of Nebraska, has this to say regarding the possibilities of cement manufacture in Nebraska: "Nebraska has almost inexhaustible beds of impure limestone, which is the material used in the manufacture of cement, but at the present prices of fuel this wealth of building material cannot be manufactured at great profit. The process of manufacture is very simple. Impure limestone, mixed with sand, is ground up and water added to make a thick paste. This flows through an iron pipe heated to a white heat so that the paste becomes dry and finally emerges from the end of the pipe as clinkers. These clinkers fall into a stone crusher and then pass between rollers, the dust falling into the sacks ready for market.

"Cement is rapidly becoming one of the prime building materials. Fence posts, sidewalks, porches, houses and department stores are made from it and in every instance the article manufactured becomes almost immune to wear and tear of weather usage. The western cowboy rears a warm and substantial cabin from cement and the city contractor builds a house of beauty from it. It is every year becoming more essential to the commerce of the world.

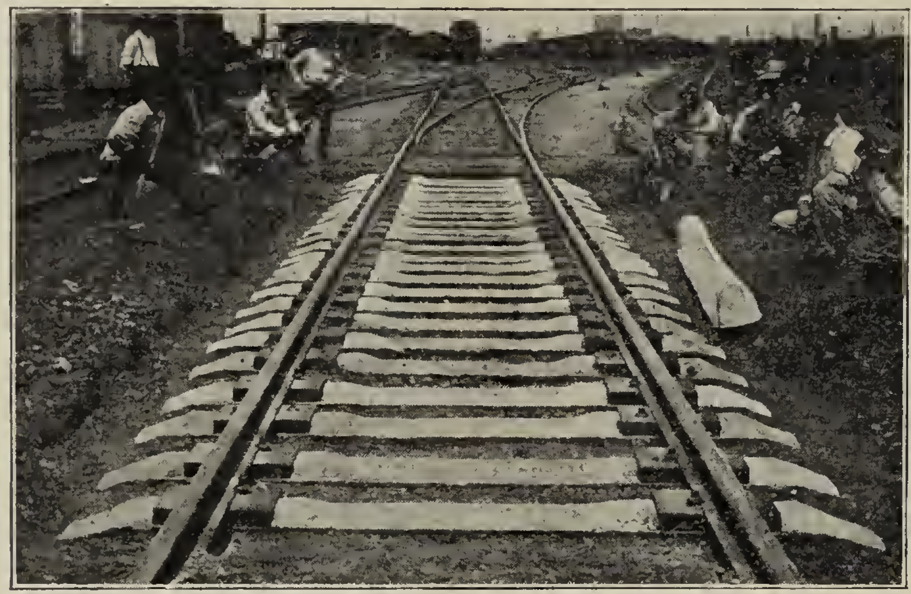
"Let gas or oil or coal be discovered in Nebraska and a hundred cement manufacturing establishments will spring up in the state. Glass factories and every kind of industry will be seeking location in our state."—Crawford (Nebraska) Tribune.

The above article is going the rounds in Nebraska county newspapers. The reported statements of Prof. Barbour have evidently been simplified to conform to the country editor's own particular and original ideas, which is simply a base of the blind leading the blind.—Ed.

REINFORCED CONCRETE RAILWAY TIES.

Railway managers the world over are looking for a substitute for wooden ties. The growing scarcity of wood as well as the frequent renewal required to keep the roadbeds in condition has already caused European and other foreign railway officials to make extensive use of metal ties, as will be seen from the following pertinent data taken from "Notes on Track Construction and Maintenance of Way," by W. M. Camp, published by The Engineering Record, New York: "In 1903 there were 34,978 miles of track laid with metal ties, the cost of steel ties in the United States varying from $2.50 to $3.50 per tie. The cost of renewing wooden ties, not counting cost of distributing averages 19.7 per cent of all expenses of track maintenance and is more than twice the cost of rails used in renewal. Excluding cost of distributing and laying, while the cost of laying wooden ties in renewal may amount to from 10 to 40 per cent of the first cost of the ties." This is reliable and shows that wooden ties require constant care and attention and that steel ties are expensive and not permanent. The one solution seems to be to substitute the reinforced concrete tie, which will not rust or decay by exposure to the elements. Neither will it require constant replacing by reason of wear and tear. It will do away with the expensive wood preserving plants now maintained to prolong the life of the wooden tie. We illustrate a stretch of road-bed laid with the Percival Reinforced Concrete Tie at Galveston, Texas. One of these ties is shown turned upside down at the right of the track. The tie is reinforced with three Johnson corrugated bars, two near the top and one near the bottom imbedded in the concrete. Two hardwood cushion blocks receive the rail. Four composition screw sockets imbedded in the concrete to receive a screw spike which holds the rail down in a strong, substantial manner. The tie is at once simple in construction, strong, safe and durable, and forms a permanent and almost indestructible roadbed. The rail can be easily and cheaply renewed without injury to the tie.

This tie is manufactured by The Percival Manufacturing Co., of Houston, Texas.



Percival Reinforced Concrete Ties.

A SUCCESSFUL BLOCK MACHINE.

A report from Rochester states that the Century Cement Machine Company, maker of the Hercules Cement Stone Machine, is increasing its facilities as rapidly as possible to keep up with the rapidly increasing demand for the Hercules machine.

Besides doing a large domestic business this concern is receiving many orders from foreign countries. Last week four machines were shipped to Ireland, the third order from a contractor who has been using the Hercules for over two years.

The manufacturers of the Hercules have had several years of experience, being among the first to turn out a good cement stone machine, and this experience is shown to good purpose in the 1906 Model Hercules, a machine that seems as perfect in construction as it is possible to make it.

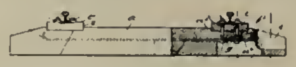
The Hercules is a very simply constructed machine, built without chains, cogs, bolts or springs. It is so arranged that two stones of the same size or design or of different sizes and designs can be made on the one machine at the same time.

On the Hercules blocks and also all kinds of ornamental work, columns, cornices, etc., from two inches to six feet, can be made rapidly and perfectly.

Many residences, apartment houses, factories, business blocks and churches are now being built of concrete, made on the Hercules and the Century Cement Machine Co. is anticipating a large demand for machines during the summer months.

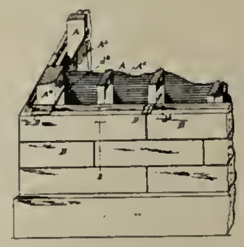
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS

814,022. Railroad tie. Walter A. Collins, Penns Manor, Pa. Filed Dec. 13, 1905. Serial No. 291,515.



A railroad tie, comprising a body of concrete or similar material, a strip of metal embedded therein, a recess arranged at each end of said body adapted to receive blocks and to hold the same in position thereon, said blocks adapted to support rails, a depression arranged at each end of said body adjacent to said recess, a depression extending beneath said blocks and communicating with said end depressions, said depressions adapted to permit of the introduction of means through said strip, body and blocks to connect the same with each other and to hold the rails in position on said blocks.

814,134. Composite structure. James H. Hood, Springfield, Ill. Filed Feb. 17, 1905. Serial No. 246,150.



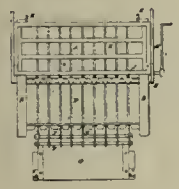
Claim.—A structure comprising stationary vertical studding, blocks contacting with said studding and having ribs and complemental channels and dimensions to form end joints between said blocks along said studding alternately, anchors having side pieces fitting over the ribs of, said blocks said sidepieces being connected by an intermediate integral member lying lengthwise of said ribs, and means for connecting both ends of said anchors with said studding to secure to a single studding the abutting ends of two adjacent blocks.

814,154. Mold for cement building walls. Alexander McCahon, St.

Joseph, Mo. Filed Mar. 17, 1905. Serial No. 250,680.

Claim.—The combination with a molding-flask, of the sides of a plurality of cement building core boxes provided with holes, the ends within the edges of said sides, the hinges and hooks on said ends, a bar pivoted centrally on a side of each box, and the rods engaging with the holes in the sides of said boxes the projecting ends of said rods serving as supports for the core-boxes through engagement with said flask, substantially as set forth and shown.

814,742. Machine for pressing concrete bricks. Henry H. Spears, Louisville, Ky. Filed June 10, 1905. Serial No. 264,557.

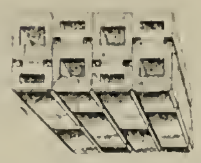


In a machine for pressing concrete bricks, and containing a mold and frame of slides, and slots widening into gutters in the lid, a row of buttons set on the rear wall of the mold, each button made up of a pin and disk, so located that they will pass through the slots and gutters, when the lid is shoved to the rear.

814,803. Concrete mixing machinery. Ernest L. Ransome, New York, N. Y. Filed Apr. 1, 1902. Serial No. 100,938.

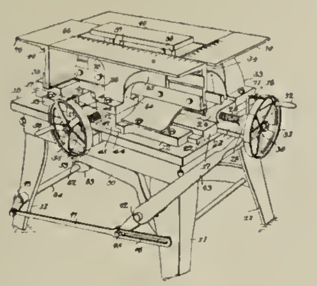
A mixer having a revoluble drum adapted to receive material at one end and discharge it at the other, the drum having a centrally-orificed head at the discharging end, a shelf secured within the drum and extending along the inner side thereof diagonally with respect to the axis of the drum, the discharge end of the shelf extending to the head at the discharge end of the drum and forming a pocket in connection therewith, an additional shelf secured within the drum and extending diagonally of the axis thereof across the first-named shelf, and a means extending through the said orifice in the discharge-head of the drum, for carrying off the material from the drum.

814,973. Building block. John Lovett, Martinsburg, W. Va. Filed Jan. 20, 1905. Serial No. 241,958.



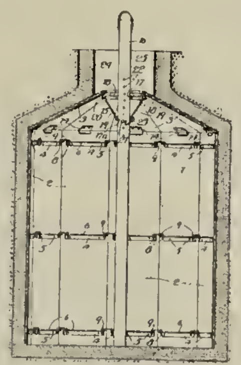
Claim.—A wall composed of hollow blocks having recessed inner corners extending throughout the length of the blocks, said blocks so placed in the wall that the corner-recesses come together, these recesses at the corners overlapping the main orifices in the center of the blocks, whereby to completely insulate and prevent dampness from passing therethrough.

815,098. Cement block machine. Andrew Klay, Bluffton, Ohio. Filed Aug. 28, 1905. Serial No. 276,138.



In a block-forming machine, a mold having movable side and end walls, means for loosely connecting the walls of the pairs, each pair constituting a side wall and an end wall, and a mold-opening means serving to space the walls from the molded block, and then to simultaneously move each pair of walls, one wall of each pair moving directly away from the block, and the other in a direction in parallel relation therewith.

815,447. Cistern-mold. William H. Lucas, Newark, Ohio. Filed Oct. 30, 1905. Serial No. 285,207.

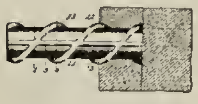


Claim.—The herein described mold comprising a plurality of side sections having their adjacent edges beveled and in contact, angle-metal cleats secured transversely on said sections, on the inner sides thereof, and having openings near their ends, and substantially inverted U-shaped clips having their arms engaged with the openings in said cleats and connecting the cleats together and thereby serving to secure said side sections together, one of said side sections having an adjustable plate on its outer side, near one edge, to bear against the opposing edge of the next adjacent side section and cover the space between them.

815,607. Building block. Christian Lugabill, Bluffton, Ohio. Filed July 12, 1905. Serial No. 269,388.

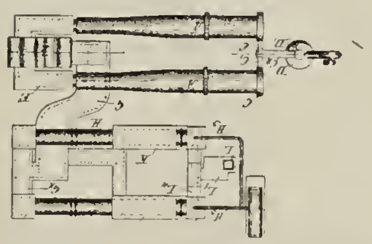
Claim.—A wall formed of a plurality of blocks, some of which are provided with lateral projections having their longitudinal edges inclined from the apex of the projections to the opposite ends of the blocks, said blocks being arranged in superposed courses with their ends at one section of the wall disposed in vertical alinement to permit the insertion of a window frame, and half blocks arranged alternately on opposite sides of the wall at said window frame and spaced from the curved edges of the adjacent blocks on the opposite side of the wall to form a vertical recess for the passage of the window sash weight.

815,619. Concrete Steel construction. William Mueser, New York, N. Y. Original application filed Apr. 20, 1905. Serial No. 256,579. Divided and this application filed June 23, 1905. Serial No. 266,624.



Claim.—A bar adapted to be used as a core to be embedded in a concrete envelop comprising a regularly formed central body and provided with external projecting ribs of uniform cross-section, extending a substantial part of the length of the bar, one of said ribs being substantially parallel to the longitudinal axis of the body, and a plurality of said ribs extending continuously around the body diagonally in the same direction and in parallel lines.

815,680. Apparatus for making cement. Rolla C. Carpenter, Ithaca, N. Y. Filed Oct. 17, 1902. Serial No. 127,647.



Claim.—In cement apparatus, a rotary kiln, a clinker-cooler adjacent said kiln, means to convey the clinker from said kiln to said cooler, a supply fan to force air into said clinker cooler to be heated therein and to force said air into said kiln, a boiler mounted adjacent said kiln, means to conduct the kiln gases through said boiler, a rotary drier, a drier furnace to heat said drier and means to conduct the gases from said furnace around said drier and then through the same and means to conduct kiln gases from said boiler through said drier.

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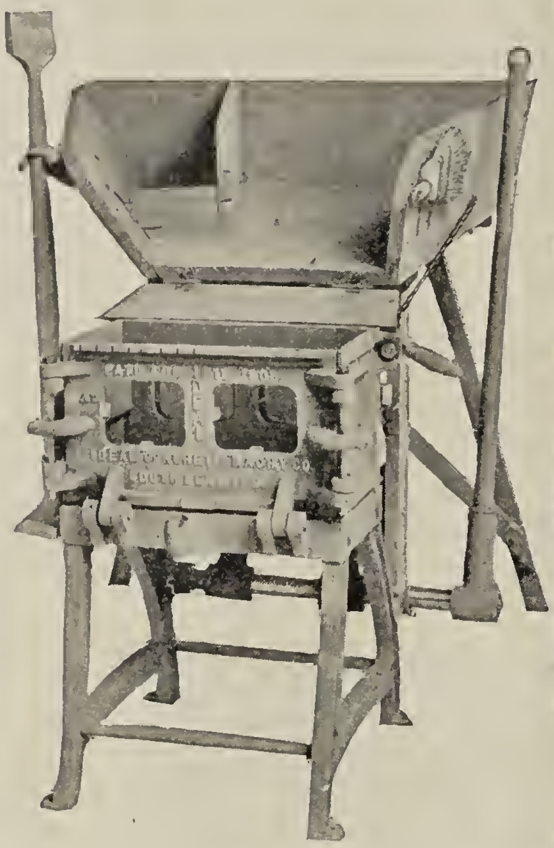

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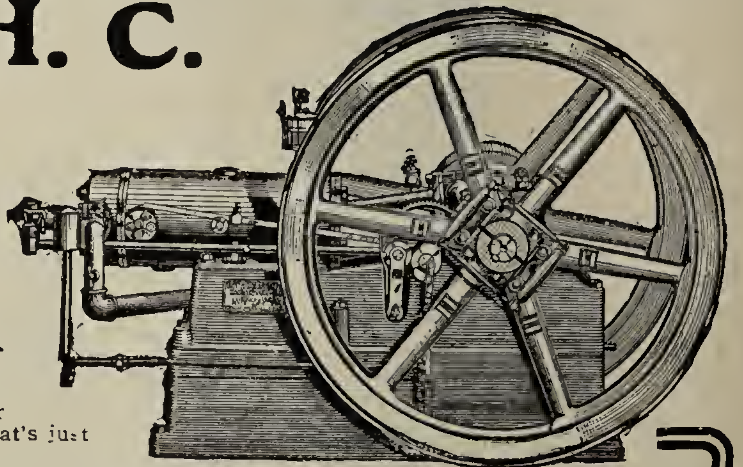

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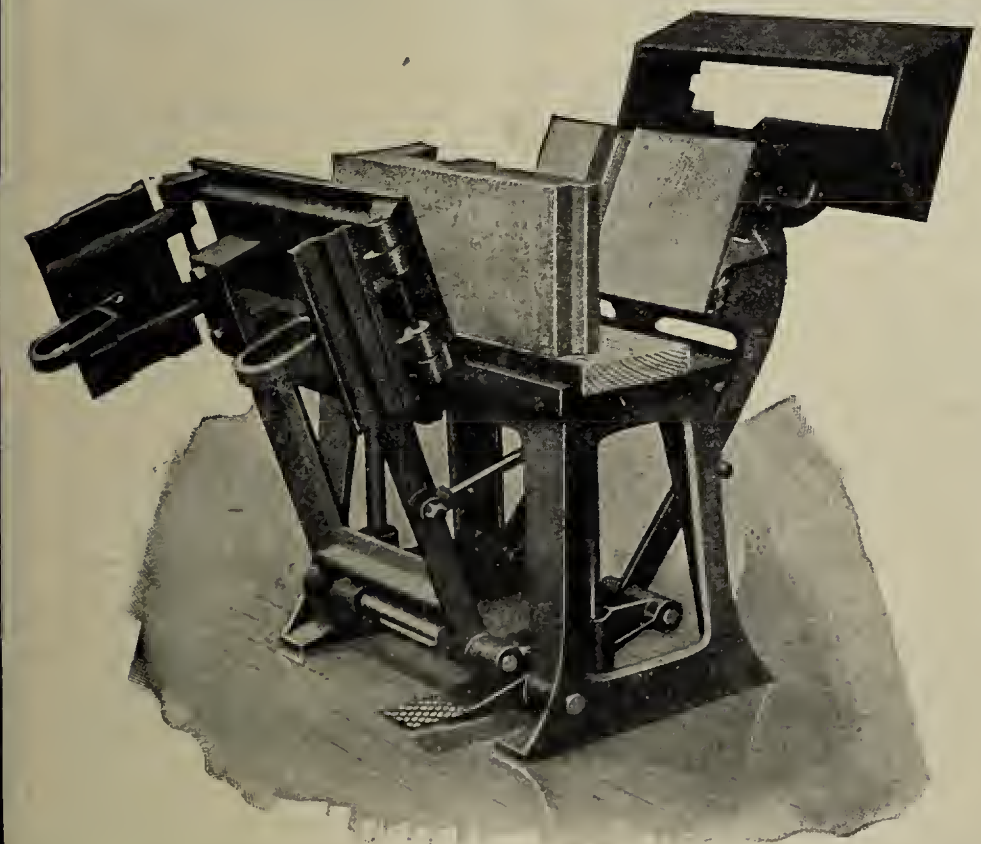

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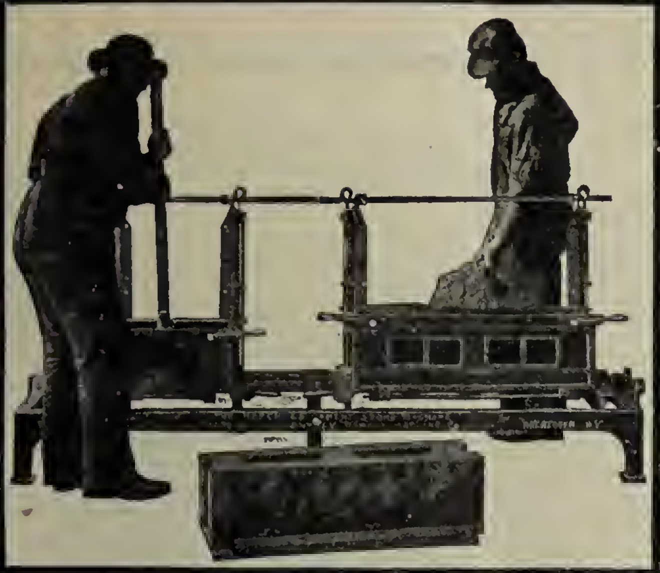

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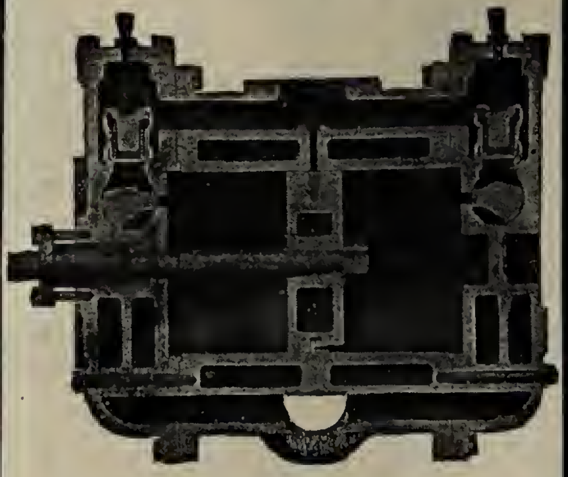

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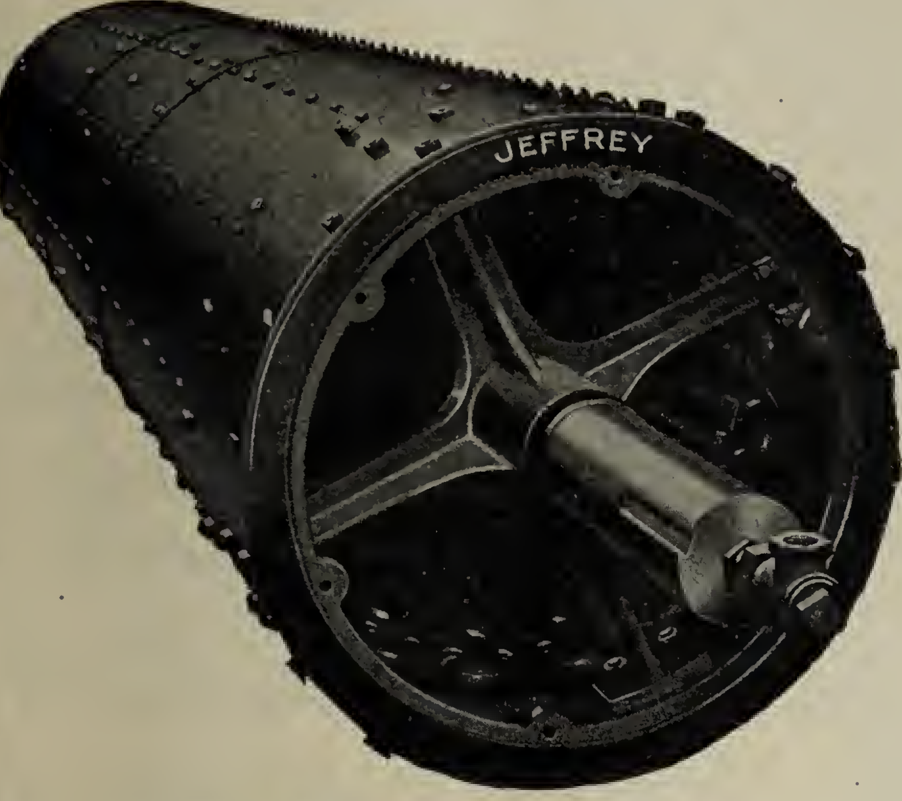

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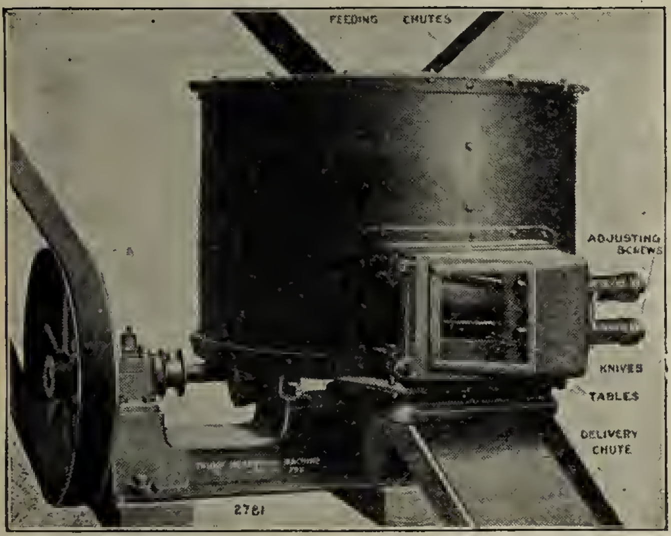

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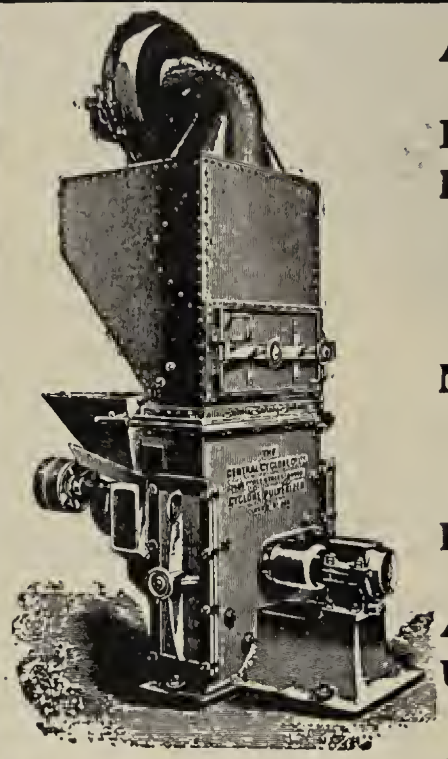

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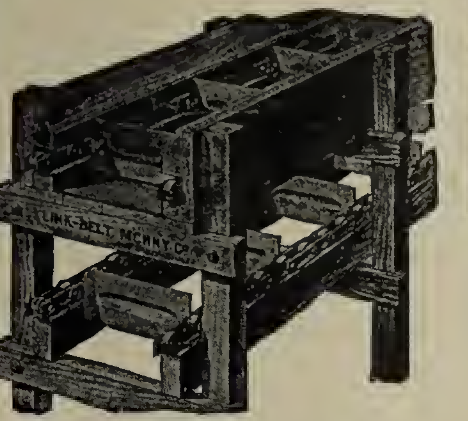

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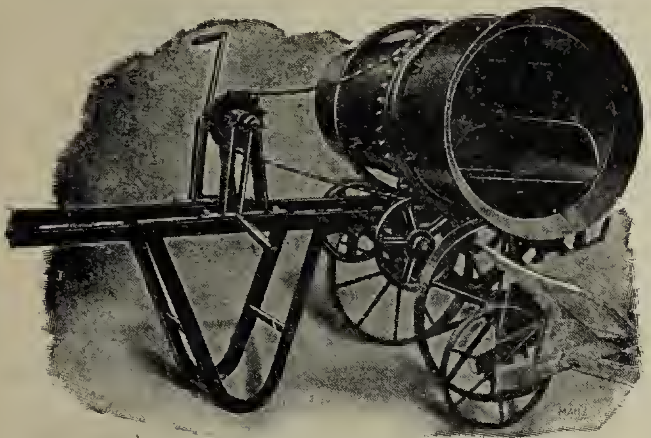

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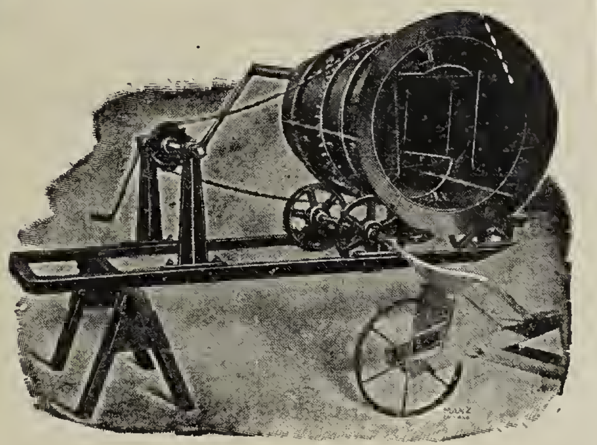

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If you earn your living with Cement Tools you **must have good tools**—We **make high grade** tools **only** and sell them **direct** to you at a price that makes you tell your friends about us. Our complete line of Cement Tools is shown in our circular No. 46, which will be sent **free** to anybody.

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We are taking orders for Tampico Fibre Brushes used in making the brush finished concrete. This finish resembles the finest cut stone work. Brushes delivered by mail at $1.00 each. Address CEMENT AND ENGINEERING NEWS, 226 La Salle St., Chicago.

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ARCHITECTS' AND ENGINEERS' HANDBOOK OF
Re-Inforced Concrete Constructions
172 pages. Illustration and Diagrams 217 Pages.
By L. J. MENSCH, C. E.
Cloth, $2.50, Paper, $2.00, Sent Postpaid.
Cement and Engineering News,
226 La Salle Street, CHICAGO, ILL.

Technical Information

Relating to Waterproofing Compound for Portland Cement Products. Prevention of efflorescence and general improvement of Portland Cement Concrete.

For information address, Box K, care Cement and Engineering News, 226 La Salle St., Chicago, Ill.

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,

228 La Salle St., CHICAGO, ILL.

10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.

Write for Catalogue D. Washington, D. C.

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July
December
November

1897
January
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1898 .... June

1899
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CEMENT AND ENGINEERING NEWS

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Garden City Sand Co.,

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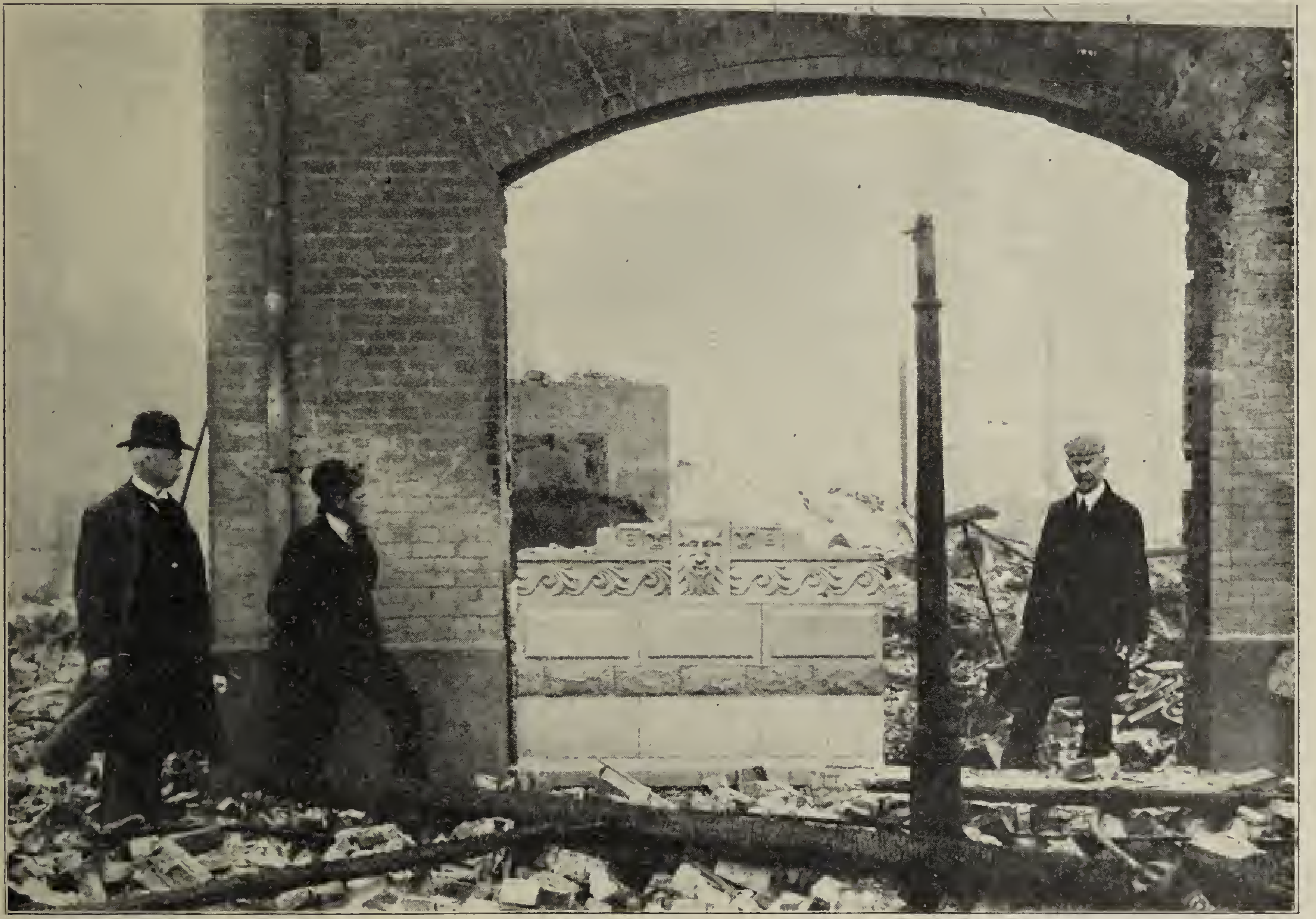

A LITHOLITE WALL THAT PASSED THROUGH THE SAN FRANCISCO FIRE WITHOUT INJURY.

These Stones Were Exposed as a Sample Product of the Pacific Stone Co.'s "Operating Under the Steven Patent" in Front of the Holmes Lime Co.'s Warehouse. While Brick and Stone Buildings for Miles Around Were Destroyed, this Particular Wall Escaped Without Injury. See Page 109 for Description.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
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Cable Address—"Seafert," Chicago.

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Advertising Rates Sent on Application

"This world belongs to the energetic"

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, MAY, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

CEMENT PLANT PROMOTORS.

There are two classes of cement plant promotors. The first, where companies are formed to engage in the manufacture of cement, relying entirely upon the manufacturing end of the enterprise for returns. While the second class form companies, erect plants and likewise engage in the manufacture of cement, these companies are usually overcaptalized, represented by an excessive issue of stock compared to the value and first cost of the plant. The promotor usually retains the lion's share of the company's stock issue. When these stocks are disposed of the promotor vanishes to repeat the same operation at some other point. Suppose, for example, that raw cement material happened to be found in Iowa, a new corporation would be formed, attended by the usual blare and blast of trumpets; the project is proclaimed far and wide, and thus the promoter, posing as a great captain of industry, paints beautiful visions in the minds of men, of hidden wealth lying dormant in their midst, which requires but the touch of enterprise to quicken into life and activity, to bring forth unbounded wealth; to all of which he (our promotor) holds the master key. With the foundations of his enterprise thus carefully laid, he retires on important business, only to re-appear, posing as a benefactor and a man of affairs, to head the procession, and, like the Pied Piper of Hamlin town, men, not children, blindly follow after him in quest of riches, to which he holds the master key; in quest of stocks he has to sell. Thus the first act of the drama closes.

Having assumed that Iowa was the center of activity, the next step in the program is the usual method of rounding up investors in that and surrounding states by personal solicitation of a body of specially trained men, who are commanded and kept in motion under the tremendous energy of the master mind in the deal. The beauty of this system is that it does not have to be worked twice in the same community; in fact, it cannot be worked twice in the same community; it requires new and virgin fields in which to bloom and entangle men. The old saying that lightning never strikes twice in the same place is equally true of this system of promotion.

The Independence, Kas., Times, under date of May 11th, 1906, contains an article which lays bare step by step the method pursued by a certain class of promotors of industrial enterprises, which should be read by the uninitiated.

THE GERMAN CEMENT TRUST.

About 648,353,200 pounds of cement and trass were imported for consumption in Holland in 1905. Of this quantity 372,053,000 pounds were imported from Prussia, 228,969,400 pounds from Belgium, 27,739,800 pounds from Great Britain, and 19,591,000 pounds from other countries. These statistics do not show the countries of origin, as the imports are only credited to those countries from which they passed into the Netherlands while in transit, and as the larger part of the cement and trass entered is from Rhenish Prussia, that country is, therefore, stated to be the largest exported. As a matter of fact, however, most of the 385,000,000 pounds imported comes from Baden and Westphalia in Germany.

Exported from the Netherlands were 309,425,600 pounds of cement and trass, principally to Germany and Belgium. This cement undoubtedly only passes through the Netherlands in transit and is not taken from the estimated amount of 385,000,000 pounds annually imported for consumption. The use of cement for concrete is increasing for buildings, bridges and tunnels. Concrete iron is also used to a great extent.

The present selling price of cement in Germany is $7.20 per 1,000 kilograms (2.204 pounds), including cost of package. It is packed in bags of about 50 kilograms (110 pounds), and after they are emptied they are returned to the manufacturer, who credits the cement purchaser with 5 cents per each bag. Besides this allowance a reduction of 32 cents per 1,000 kilograms is made to all persons buying in large quantities, and an additional reduction of 8 cents per 1,000 kilograms to those buyers who act in conformity with the rules of the German trust. This makes the actual cost of the cement delivered at Rotterdam or Amsterdam only $5.80 per 1,000 kilograms.

There is no doubt whatever, says the United States consul, that American Portland cement could be sold in the Netherlands, provided the quality is good and has a resisting power of 25 kilograms per centimeter, and that the American manufacturers could offer sufficient inducements and guarantee lower prices delivered at Rotterdam or Amsterdam than are quoted by the German trust.

The largest cement users and dealers are the Hollandsche Beton Maatschappy, Conradkade, The Hague; Stuhlemeyer & Co., Breda; Nederlandsche Cementsteen-Fabriek, Delft; and Koninklyke Rotterdamsche Cementsteen-Fabriek v. H. Van Waning & Co., Rotterdam. Besides there are at Rotterdam the following smaller cement-stone manufacturers: Nieuwe Rotterdamsche Cementsteen-Fabriek, Crooswyk; D'Agnolo & Storni, 63 Delftsche straat; and L. H. Kurpershoek, 76 Zwaanshals.

The U. S. Portland Cement Co. of Denver, Colo., has been incorporated. Capital $800,000. W. H. Kelso, Lee Champion and J. D. Blunt of Florence, W. H. Spurgeon and C. Cassidy of Colorado Springs and Wm. O'Gara of Denver are financing the project. The company owns 360 acres long one mile east of Portland, Fremont Co., Colorado, carrying good raw cement materials, upon which the plant is to be erected. The buildings will be large enough for a 2,000 barrel plant. Machinery for a 500 barrel output will be installed at present. The rotaries will be 120 feet long. The plant will be built on the gravity system. Water power rights have been acquired on the Arkansas river.

INSTRUCTIONS IN THE USE OF CONCRETE AT COUNTY FAIRS.

Practical instructions in the use of concrete will be given to farmers at the next Free Fair to be held at Winona, Minn. The fair directors have provided ample space in a large tent to be erected on the fair grounds, where hourly demonstration will be given in the proper mixing of concrete and its application in constructing floors suitable for farm buildings. A practical man will be in charge of the work, who will answer questions, during the entire week of the fair. It is expected that farmers will be attracted in large numbers from far and wide to profit by these demonstrations, so that they may do their own concrete work in the future by following closely the instruction laid down. This is a move in the right direction. The work should be taken up by other fair managers throughout the country.

EARTHQUAKE PROOF BUILDINGS.

Patrick J. Donohoe, architect and expert for the construction of the ferry building in San Francisco during the administration of Gov. James H. Budd, in 1895, believes there will be no trouble in rebuilding San Francisco. The fact that the ferry building has withstood the shocks of the earthquake has proved the soundness of the cement and steel method of construction.

"The question now being asked by all architects is, How shall we provide what can be positively depended on for stability under all circumstances?" said Mr. Donohoe. "Reinforced concrete solves the problem, I believe. The ferry building demonstrates this. A twenty-story building constructed in this manner would ride on the breaking, swaying earth exactly in the same manner that the mammoth Hill liners ride over the waves. I would stand the building on a slab of grillage and concrete. In this manner the iron is so strongly reinforced and bolted together that any rupture of ,the one slab upon which the structure stands would be practically impossible.

"No brick nor terra cotta should be used. All masonry should be Ferro-concrete. The exteriors could be faced by molding the concrete into decorative designs. No wood except of the fireproof kind, and that for doors and windows only, and the carpets should be lined with asbestos. This would be a fireproof and earthquake proof structure.

"I doubt the statements that there were no such buildings to act as a fire wall. It goes without saying that the board of underwriters will revise the present building ordinance at once.

"In my opinion, the reign of steel is past, and that we are returning to the time-honored masonry construction, not to brick or stone, but to concrete, strengthened by steel. It is a mistaken idea that concrete is a modern substance. It was one of the most valuable assets of the ancient engineers. The great dome of the Pantheon in Rome, 142 feet in diameter, was constructed entirely of this material, and it has withstood the ravages of nature for nearly 2,000 years. In Old Mexico can be seen the remains of buildings which were constructed by an unknown race. These buildings all have concrete foundations. In the Italian colonies of Magna Grecia there is evidence that the ancient Greeks used concrete. The walls of Reading abbey, in England, were apparently faced with square blocks of stone on each side. Although the stone appears to have perished, the concrete still remains."

The Sandusky Portland Cement Co. is manufacturing cement blocks to be used in the construction of its new plant at Dixon, Ill. The progress of the work is being retarded by the scarcity of labor and teams in the vicinity.

A CEMENT BRICK SWINDLE.

Thos. P. Keyes of St. Louis, who maintained an office at 801 Chestnut street, in that city, where he had on exhibition a few cement brick made on a hand machine. With this stock in trade he represented himself as a cement brick manufacturer, operating a steam plant with a capacity of 50,000 cement brick per day, under the name and style of the St. Louis Cement Brick Manufacturing Company. Under these representations he sold on July 6, 1905, 20 shares of stock to Wm. Perrig, a Michigan farmer, who paid $1,000 cash and $1,000 in notes. Keyes was arrested, tried and convicted and sentenced to serve a term of two years in the Missouri State Penitentiary. The case was appealed to the Supreme Court, where the sentence was affirmed. Keyes is now in the penitentiary.

The Evening Star of Independence, Kan., under date of May 2d, 1906, contains an article descriptive of the new Kansas Portland Cement Co. of the same place, from which we condense and rearrange a few statements: "The Kansas Portland Cement Company, representing an investment of $1,000,000, will have a capacity of 3,000 barrels per day. The Western States Portland Cement Company of the same place, built less than one year ago at the cost of $1,500,000, has less than one-half the capacity of the Kansas Portland Cement Co. plant, showing the great improvements made in machinery and appliances in a single year."

The Superior Portland Cement Co. has been incorporated under the laws of Ohio. Capital $55,000. The plant is to be located at Center Station, Lawrence Co., O., on the Detroit, Toledo & Ironton Ry. The following stockholders have been named: Justus Collins of Charleston, W. Va., has taken $100,000 of the stock; A. L. Sternberger, Jackson, Ohio, $100,000; D. G. Wright of Philadelphia, Pa., and Ernst Du Brul of Portsmouth, O.

LITHOLITE STONE FIREPROOF.

Our first-page cut shows a portion of a wall that passed through the San Francisco disaster, being a practical demonstration of the fire resisting properties of first class concrete stone. The absolutely uninjured piece of wall shown under the brick arch was a five course sample wall in one of the doors of the warehouse of the Holmes Lime Company on Sacramento street, near Market, the very center of the area of high temperature, from which point ruins extend for miles in three directions. The street pavement directly in front of the litholite wall shown was made of blocks of basalt. The heat was so intense as to flake off pieces one inch thick from this pavement, while the granite curbing was shattered into fragments. The glass from the broken windows of the doorway fell upon the top of the litholite wall and melted there. The only effect of the fire upon the litholite stones was to clean or remove the dust and soot which had gathered upon them during several months' exposure before the fire, all of which goes to the establishment of the fire resisting properties of well made concrete.

We are indebted to Wm. B. Gester, C. E., president of the Pacific Stone Company of Berkeley, Cal., for photographs and notes in this article.

The Kansas cement mills have been making a mill price of from $1.40 to $1.50 per barrel. This will enable the laying down of cement on the coast at $2.80 to $2.90 per barrel, or less than the freight tariff at the 75c rate.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	....	....	....	....	6,997,424	$ 22.910	6,830,780	$ 21,936
Belgium..........	8,864,935	$ 27,238	19,242,170	$58,700	115,205,598	377,677	90,709,638	279,784
France............	....	....	11,316	115	5.511,299	21,713	5,318,476	19,685
Germany..........	4,234,617	16,086	2,916,586	....	153,754,787	519,580	134,689,892	452,423
All Other Europe.	....	....	396	1	1,226.901	4,219	396	1
British North Am.	....	....	....	....	144,915	763	39,650	247
Other Countries..	2,000	10	300	2	1,871,264	7,166	54,155	501
TOTAL..........	13,101,552	$43,334	22,170,768	....	284,712,188	$951,028	237,612,987	$774,577
Domestic Exports of Cement, bbls.	38,102	$56,710	25,987	$41,092	669,687	$950,252	618,154	$854,516

There were 13,450,678 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in February 1905, valued at $43,032, against 5,873,659 lbs. in February 1906, valued at $17,502.

For 8 months ending in Feb. 1905, there were 89.296 tons of asphalten imported in the United States, valued at $353,933, against 44,055 tons imported in 8 months ending Feb. 1906, valued at $202,104.

OKANOGAN IRRIGATION PROJECT.

The U. S. Reclamation Service is asking for bids for the construction of irrigation works near Conconully, Washington, which will include much plain and reinforced concrete work. Our illustrations taken from the government drawings show the nature and extent of the concrete work called for:

Fig. 1—Map of Conconully reservoir and outlet at Salmon Lake.

Fig 2—Plan and sections of concrete for outlet works at Salmon Lake.

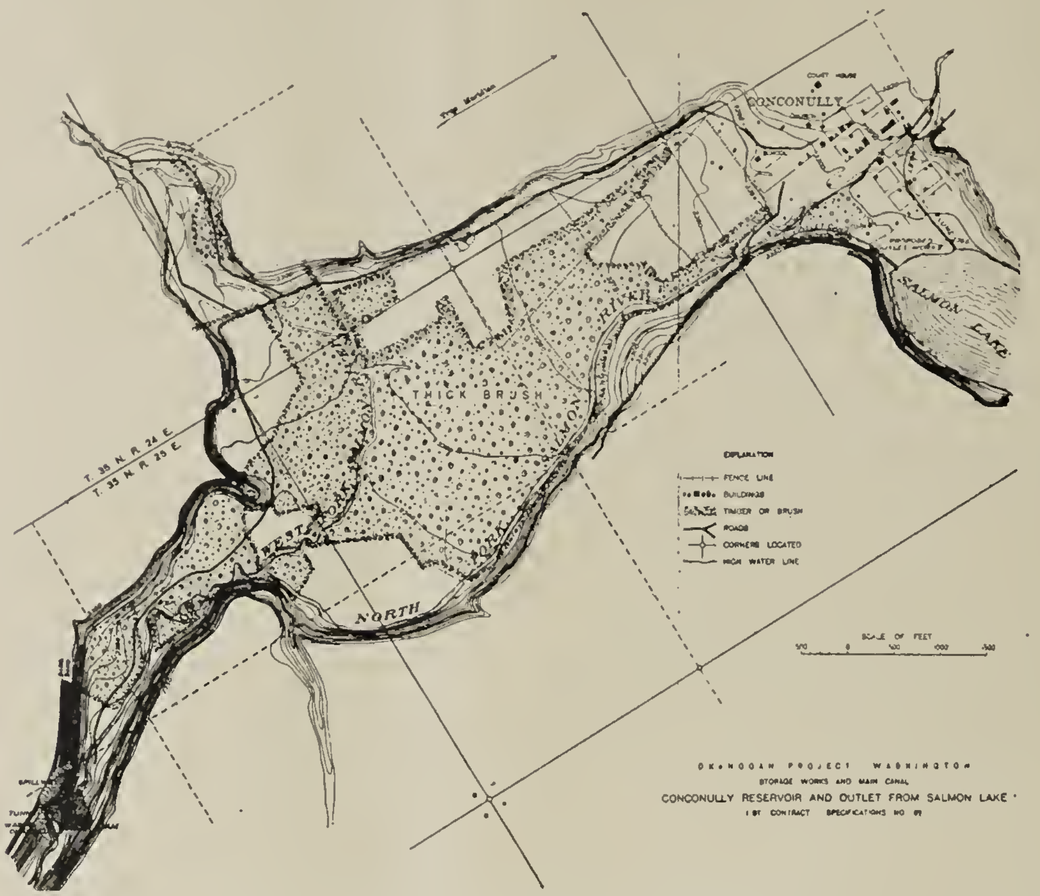


Fig. 1. Conconully Dam and Salmon Lake Outlet.

Fig. 3—General plan of Conconully dam and spillway.

Fig. 4—Diagram of drill holes and test pits, Conconully dam, showing the nature of the soil to be excavated.

Fig. 5—Concrete work in gate tower, gate house, foot bridge at Conconully dam.

Fig. 6—Outlet conduits, profile and details at Conconully dam.

Fig. 7.—Profile and section of drop No. 1, main canal.

Fig. 8—Sections and minor structures of main canal.

The storage works, comprising Salmon Lake outlet and Conconully reservoir, call for 322,500 yards of earth excavation and 4,100 yards of rock cut and 1,030 cubic yards of plain concrete masonry, 630 cubic yards of reinforced concrete work. The government furnishes all cement and steel required, delivered on board steamer at Brewster, on the Columbia River, about thirty-five miles by wagon road from the work.

The concrete work is divided into two classes—namely: classes A and B. Class A includes all plain concrete, lining for the spillway shown in Fig. 3 and a portion of Fig. 7, as well as the waste channel and the canal. Class B includes all concrete not falling under class A, being mostly reinforced concrete, as shown in Figs. 2, 5, a portion of Fig. 7 and 8.

All concrete must be machine mixed in the following proportions: By volume, one part cement to seven of aggregates, and one part cement to nine of aggregates, being understood to mean the sum of the volume of sand and gravel or broken stone, measured before mixing.

Bids will be received for the work up to 2 p. m., June 27, 1906. Particulars may be obtained by addressing U. S. Reclamation Service at Washington, D. C., or at Portland, Ore., or Pogue, Wash.

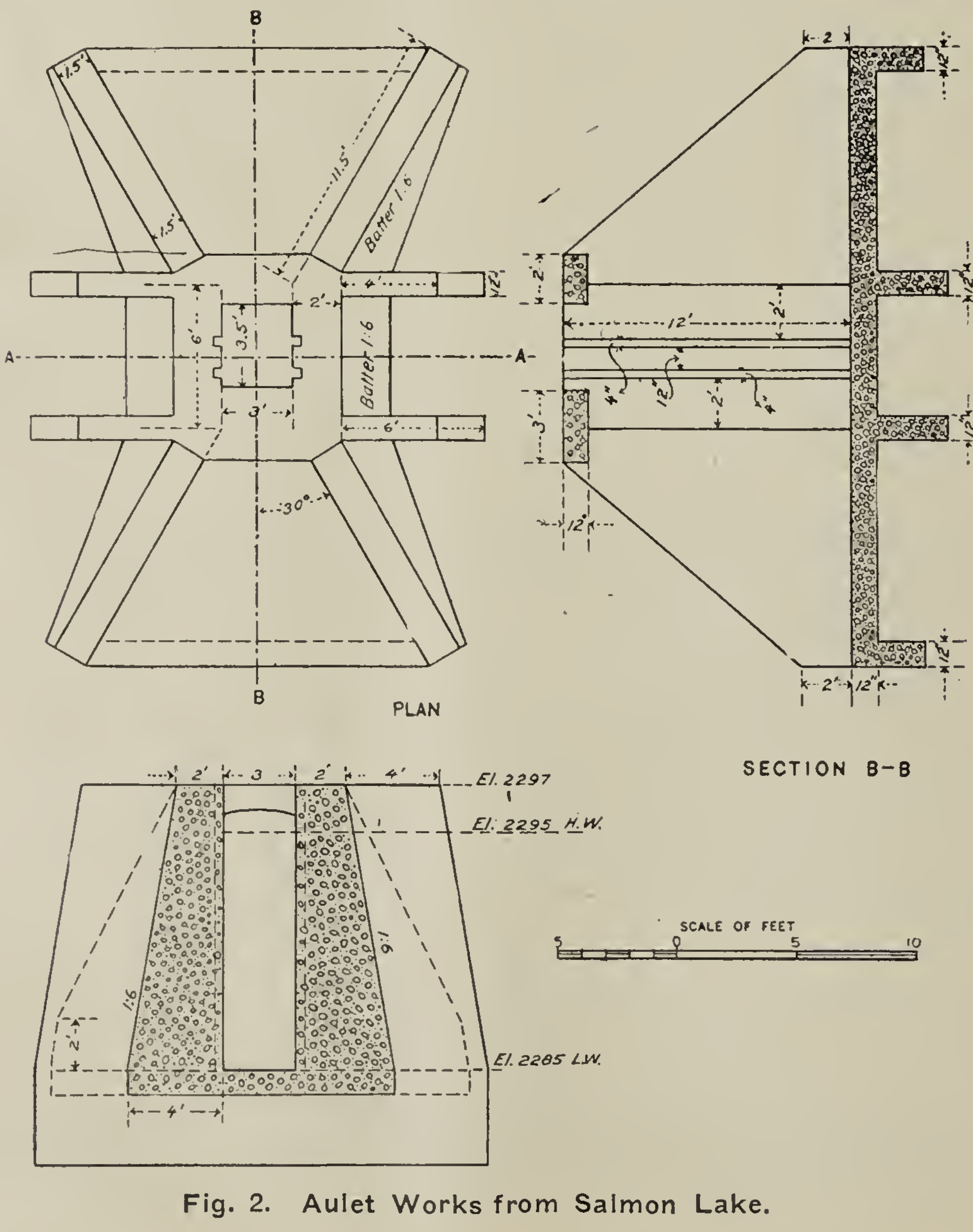


Fig. 2. Aulet Works from Salmon Lake.

The Oakland, Cal., Builders' Exchange has tendered the free use of its rooms to members of the San Francisco Builders' Association.

Provisions have been made to register the names of skillful mechanics looking for work in the building trades, from which register contractors will be supplied with skilled help free of cost.

Prices prevailing before the earthquake will be maintained as far as possible by members of the Oakland exchange.

Constitution of Hydraulic Cement, by Dr. Wm. Michaelis, Sen., will be published in the June issue of Cement and Engineering News.

REMOVAL NOTICE.

Cement & Engineering News has removed to 22 Fifth avenue, Rooms 504-5 and 6.

A NEW CEMENT BURNING PROCESS.

The P. C. Lime & Cement Company of Salt Lake City, Utah, filed articles of incorporation with the county clerk May 4. It owns claims in the Hot Springs district. The company is capitalized at $7,800, divided into shares of $100 each. The officers are: President, Joseph G. Bywater; vice-president, L. P. Palmer; secretary, J. L. May; treasurer, P. O. Perkins. The other directors are W. A. Lanford, H. W. Griffiths and H. C. Edwards.

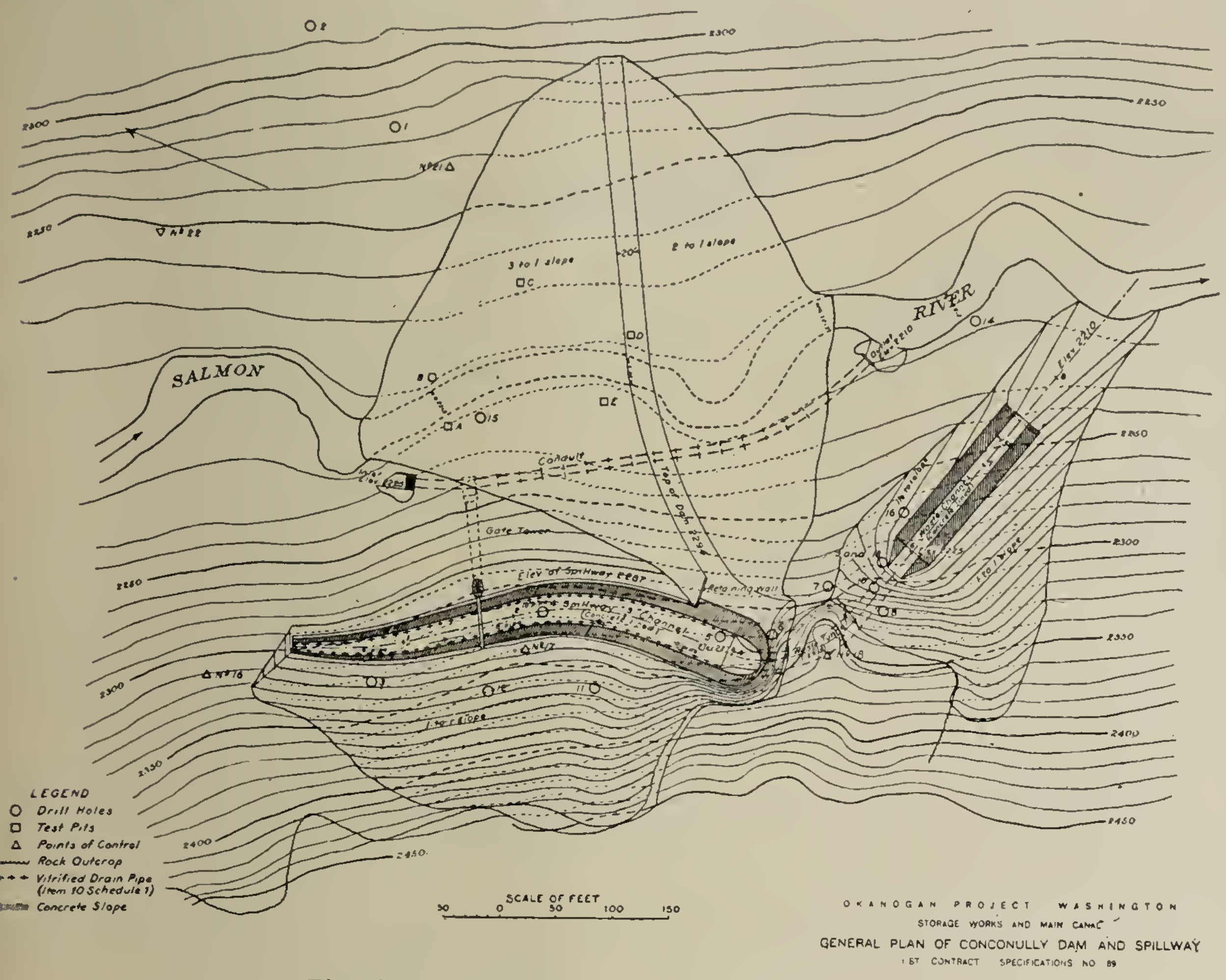

SALMON
RIVER
LEGEND
○ Drill Holes
□ Test Pits
△ Points of Control
Rock Outcrop
Vitrified Drain Pipe (Item 10 Schedule 1)
Concrete Slope
SCALE OF FEET
50 0 50 100 150
2300
2350
2400
2450
OKANOGAN PROJECT WASHINGTON
STORAGE WORKS AND MAIN CANAL
GENERAL PLAN OF CONCONULLY DAM AND SPILLWAY
1ST CONTRACT SPECIFICATIONS NO 89

Fig. 3. Plan of Dam and Spillway.

NEW CEMENT COMPANY.

Mr. L. Doherty, of Madison, Wis., has been granted a patent on a new method of burning cement, which consists in returning from 5 to 25 per cent of the hot finished clinker from the discharge end of the rotary kiln to the intake where the hot clinker is mingled with the raw cement mixture and fed into the kiln, the object being to recover the heat carried by the hot clinker and thereby economize in fuel, as well as to increase the output of the kiln.

PACIFIC COAST CEMENT RATE.

The Southern Pacific Railway Co. has reduced the rate on cement from Missouri River points to the Pacific coast from 75c to 35c per hundred, which makes a rate of $1.40 per barrel. The Los Angeles Herald, under date of May 11th, says:

"Los Angeles is almost continually on the ragged edge of a cement famine. Building here is so rapid and on such an extensive scale that the building material market is kept awake nights trying to supply the demand. And in view of the quick reconstruction work in San Francisco, there were grave fears that building in this city would be retarded, if not stopped, by the scarcity of material—particularly cement, for which the demand is always greater than the supply.

"The action of the Southern Pacific railroad will tend to bring in large quantities of this much desired material and will help forward the prosperity of this city."

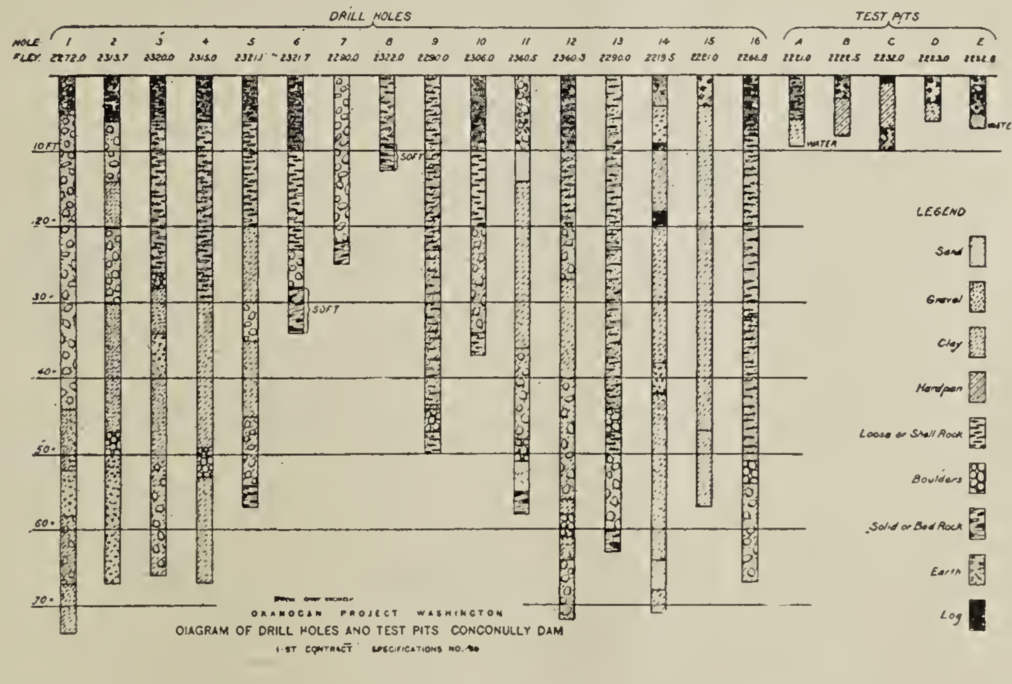


Fig. 4. Drill Holes and Test Pits, Conconully Dam.

The Acme Cement Co., manufacturers of plaster, have located a new mill site at Acme, near Roswell, Chaves county, New Mexico, on the Pecos Valley Railway, 175 miles north of Pecos, Texas. Col. L. B. Jacobs, general superintendent of construction for all the Acme company's plants, is on the ground pushing the work. The plant is to have a capacity of 10 cars per day. The main building will be 262x52 feet. Houses for workmen will be erected.

Sebastiano Gozzo, an Italian laborer employed at the Franklin, Pa., coke plant, fell headlong into a concrete mixer, and before the engine could be stopped his body was literally crushed to pieces in the machinery. Every bone was found to be broken, and the head was the only part of the body recognizable.

The Guthrie Capital says the Oklahoma Oolite Stone Co. of Guthrie, I. T., will erect a Portland cement mill on its quarry site in the near future.

Bozeman, Mont., May 20.—The Montana Portland Cement Company is about to incorporate for business with a capital stock of $600,000. The incorporators are Montana men, with the exception of Gordon Mackay of Olympia, Wash.

About 225 employes of the Alma Cement Company struck on May 9th because the company would not recognize their union. The places of the strikers were filled by 200 Polish laborers from the east.

The deposits have been tested by several chemical experts, among them Professor Heinrich Reis of Cornell University. His analysis, corroborated by government experts, shows the essential elements for the manufacture of Portland cement in a high grade of purity. The demand for the product is great, and the company will erect a mill at once with a capacity of from 600 to 1,000 barrels per day. Bozeman is to be the principal place of business.

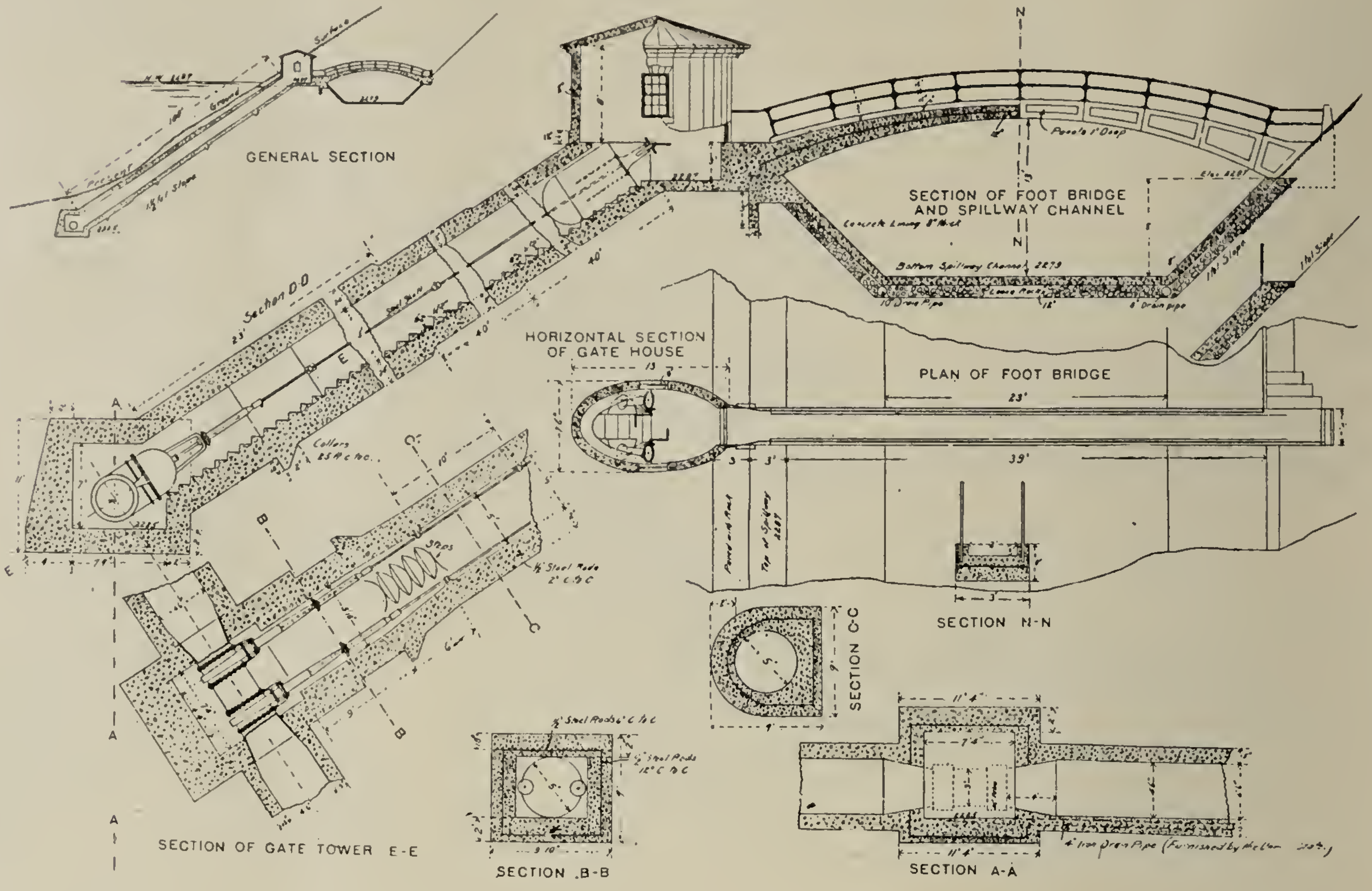


Fig. 5. Gate Tower House, Foot Bridge, at Dam.

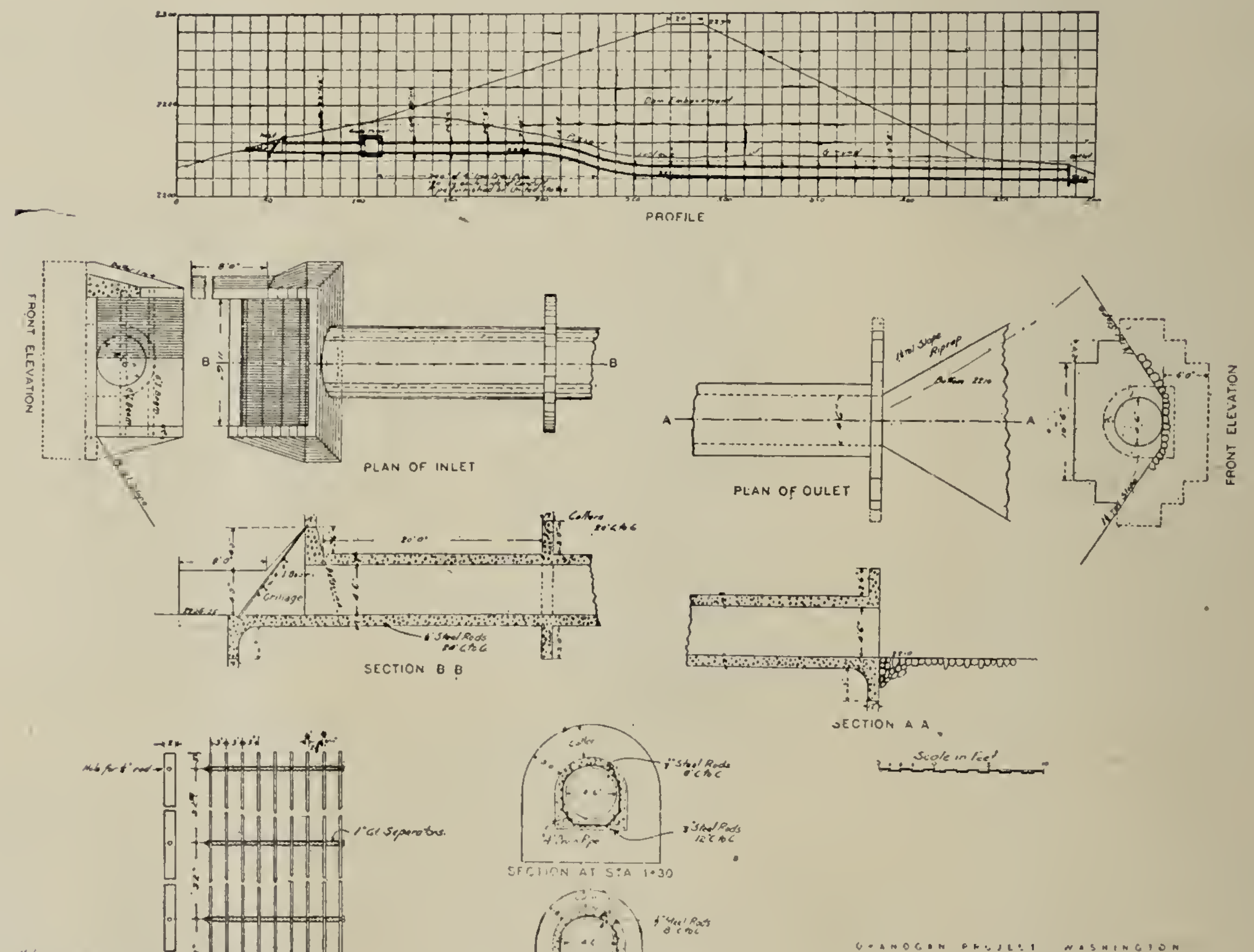

PROFILE
FRONT ELEVATION
PLAN OF INLET
PLAN OF OULET
FRONT ELEVATION
SECTION B B
SECTION A A
Scale in feet
DETAIL OF ONE SECTION OF GRILLAGE
SECTION AT STA 1+30
SECTION AT STA 3+20
OKANOGAN PROJECT WASHINGTON
STORAGE WORKS AND MAIN CANAL
OUTLET CONDUIT, PROFILE AND DETAILS CONCONULLY DAM

Fig. 6. Outlet Conduit and Details of Dam.

EFFECT OF CLAY IN CEMENT MORTAR.

Investigations on the effect of clay on the tensile strength of Portland cement mortar have shown surprising results, the clay in some cases having increased the strength and in others materially reduced it. In a 1 to 1 mortar no addition of clay produced a gain, while the losses with various mixtures amounted to a maximum of 50 pounds in an original strength of 680 pounds. With 1 to 2 mortar, having a strength of 595 pounds, 3 per cent of clay in the sand caused a drop to 550 pounds, while 16 per cent was accompanied by a rise to 615 pounds. With 1 to 3 mortar the tensile strength increased from 375 pounds with clean sand to 555 pounds with 16 per cent clay, but then fell off to 365 pounds with 40 per cent clay. An increase was experienced with 1 to 4 mortar from 300 pounds with clean sand to 445 pounds with 20 per cent clay. A falling off then ensued, bringing the strength down to 270 pounds with 50 per cent of clay.—Iron Age.

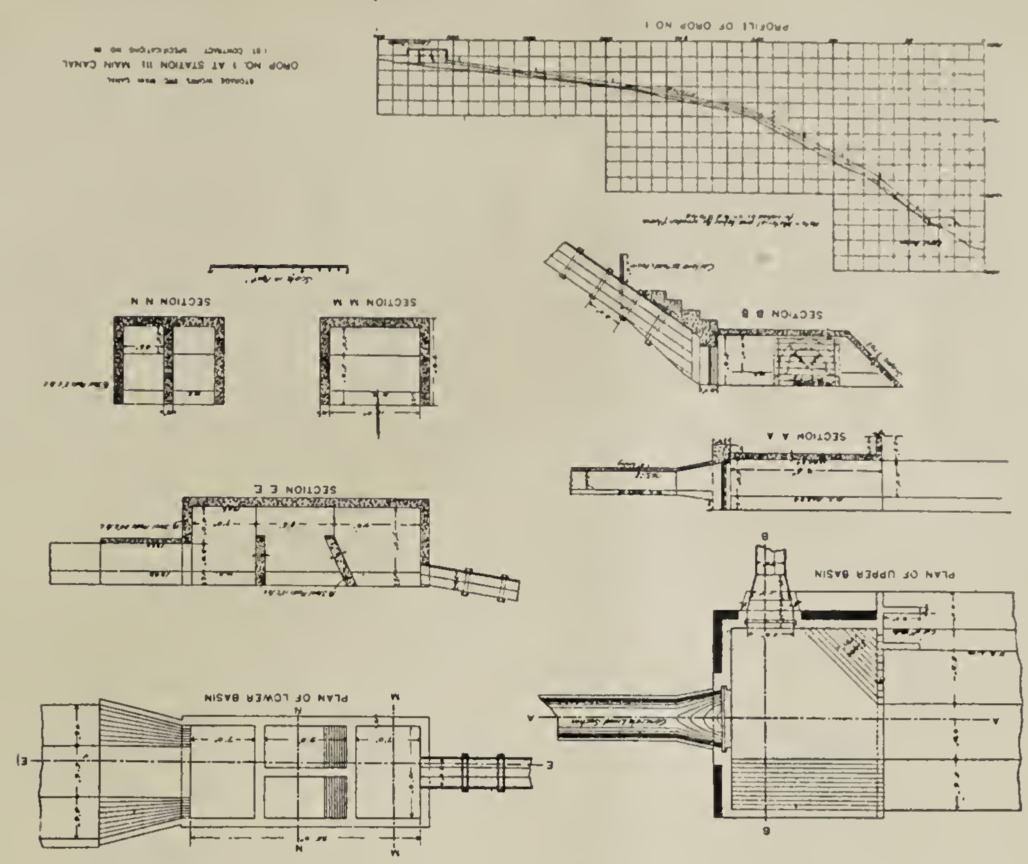


Fig. 7. Drop No. 1 at Station 11, Main Canal.

The Empire Portland Cement Company, at its annual meeting, May 9th, elected the following officers: President, General Charles Miller of Franklin, Pa.; vice-president, George Miller of Buffalo; secretary and treasurer, J. B. Moorehead of Franklin, Pa.; manager, H. S. Hayden of Syracuse. The factory will be started about May 20 and practically the entire output for 1906 has been sold at advanced prices over last year.

Montgomery, Ala., May 8.—The Atlantic and Gulf Portland Cement Company, organized under the laws of the state of New Jersey, has qualified to do business in Alabama, with A. T. London of Birmingham as the state agent. It has a capital of $10,000.

The Chanute Cement and Clay Products Co. will construct a Portland cement plant at Chanute, Kansas, where it owns 366 acres of land, conveying extensive deposits of cement material. Over 4,000 acres of oil and gas leases have been secured. A $2,000,000 first mortgage 6 per cent 20-year sinking fund gold bond issue has been authorized with the Cleveland Trust Co. of Cleveland, O., as trustee. The proceeds of the sale of these bonds is to be applied in the construction of a 3,000-barrel mill on the company's property at Chanute. The officers of the company are as follows: J. F. Townsend, president; J. R. Patterson, vice president and general manager; Henry Robinson, treasurer, of Akron, O. Mr. J. R. Patterson of Union City, Mich., is general manager of the Peerless Portland Cement Company, and the Bronson Portland Cement Company has been the leading spirit in the present enterprise. This project is in good hands.

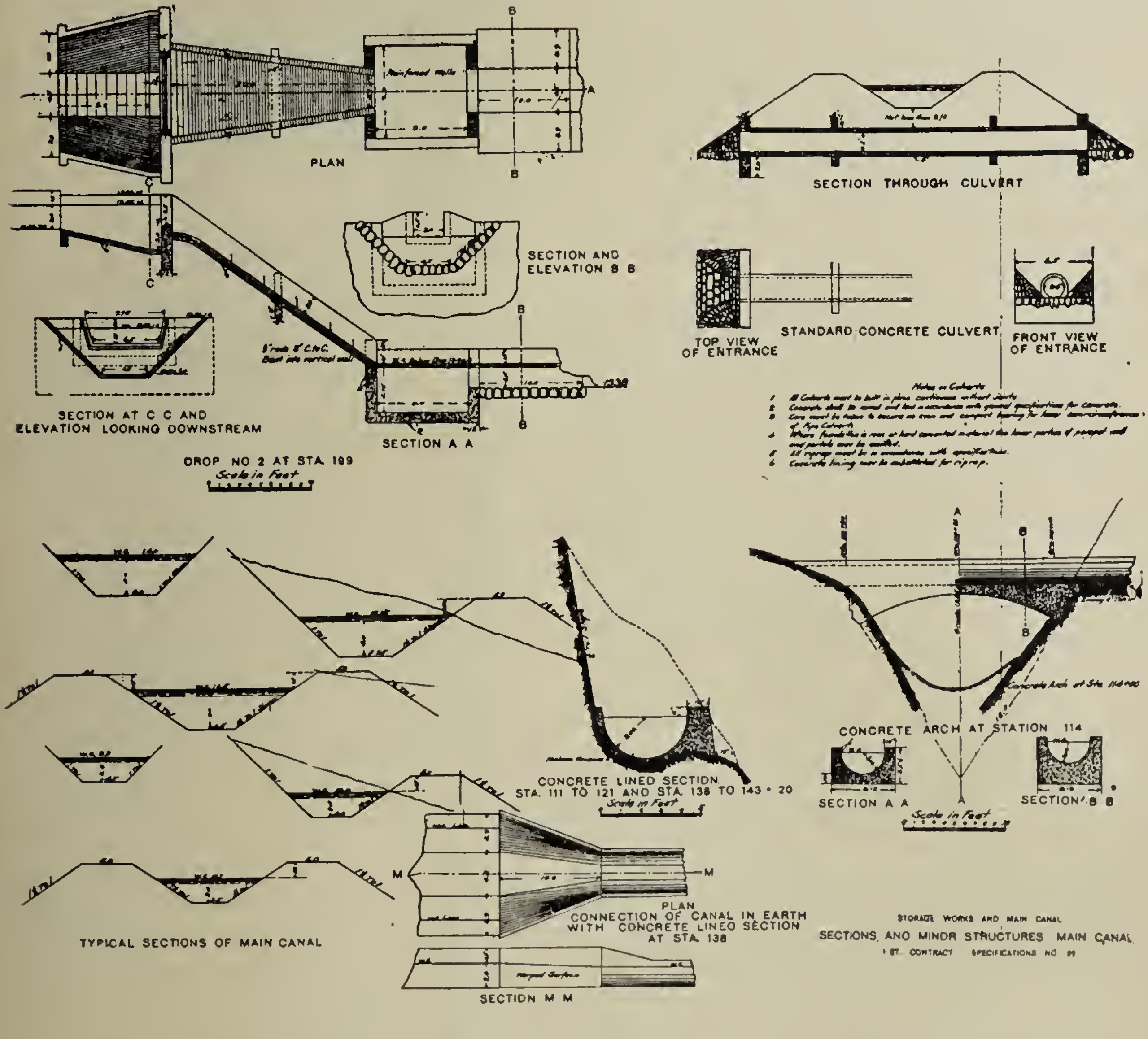

PLAN
SECTION AND ELEVATION B B
SECTION AT C C AND ELEVATION LOOKING DOWNSTREAM
SECTION A A
DROP NO 2 AT STA 189
Scale in Feet
SECTION THROUGH CULVERT
TOP VIEW OF ENTRANCE
STANDARD CONCRETE CULVERT
FRONT VIEW OF ENTRANCE
Notes on Culverts
CONCRETE ARCH AT STATION 114
SECTION A A
SECTION B B
Scale in Feet
CONCRETE LINED SECTION STA. 111 TO 121 AND STA. 138 TO 143 + 20
PLAN CONNECTION OF CANAL IN EARTH WITH CONCRETE LINED SECTION AT STA 138
SECTION M M
TYPICAL SECTIONS OF MAIN CANAL
STORAGE WORKS AND MAIN CANAL
SECTIONS AND MINOR STRUCTURES MAIN CANAL
1 ST. CONTRACT SPECIFICATIONS NO

Fig. 8. Section of Minor Concrete Structure, Main Canal.

AMERICAN SOCIETY FOR TESTING MATERIALS.

The ninth annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., June 21-23. The next congress of the International Association for Testing Materials will be held at Brussels, Belgium, Sept. 3-8. The total membership of the American Society is now 786, of whom only about 240 are members of the international association.

The following fifteen official papers are to be presented at the next congress of the International Association at Brussels. They have been printed in English, German and French, and will be mailed to each member of the International Association. A second series of papers relating particularly to iron and steel are in course of preparation and will be available for distribution before the date of the congress:

1. Report on Problem 4.—"Methods for the examination of welding and weldability," by Professor Reinhold Krohn, Geheimer Regierungsrat in Danzig.

2. Report on Problem 37.—"Report on the progress of metallography since the congress at Budapest, 1901," by F. Osmond and G. Cartaud, Paris.

3. Report on Problem 7.—"On the relation of chemical composition to the weathering qualities of building stones; the influence of smoke, especially sulphurous acid, on building stones; the weathering qualities of roofing slates." Report by the chairman of commission 7, A. Hanisch, Baurat, k. k. professor; with appendix I, "Tests for weathering resistance of sandstones," by Professor Dr. H. Seipp; and appendix II, "Results from trials on Swiss roofing-slate, together with some importations," a "the formation and texture of clay-slate," by Prof. D. A. Heim, b "Results of the physical-chemical researches," by Professor L. v. Tetmajer.

4. Report on Problem 10.—"Examination and evaluation of the resolutions of the conferences of 1884-1893 concerning the adhesive strength of hydraulic cements." Report by R. Feret, Chef du Laboratoire des Ponts et Chaussees a Boulogne s/M.

5. Report on Problem 11.—"To establish methods for testing puzzuolanas with the object of determining their value for mortars." Report by the chairman of committee 11, G. Herfeldt, Andernach.

6. Appendix to the Report on Porblem 11.—"Experiments made in the laboratoire des ponts et chaussees de Boulogne s/M. with a view of determining the methods for testing puzzuolanas." Report by R. Feret.

7. Report on Problem 29.—"Determination of the liter weight of cement. The strength of real hydraulic cements. Determination of a standard sand." Report by Prof. F. Schule, manager of the Federal Testing Institute for Materials, Zurich.

8. Report on Problem 30.—"Determination of a uniform method for the separation of the finest particles in Portland cement by liquid and air processes." Report presented by Professor M. Gary, Gross-Lichterfelde-West.

9. Report on Problem 31.—"On the behavior of cements in sea water." A note upon the decomposition of cements in sea water by H. le Chatelier, Ingenieur en Chef des Mines, Professeur au College de France, Paris.

10. Report on Problem 32.—"On accelerated tests of the constancy of volume of cements," by Bertram Blount.

11. Report on Problem 17.—"On methods of testing pipes." Presented by Professor M. Gary, Abteilungsvorsteher des konigl, Materialprufungsamtes in Gross-Lichterfelde-West.

12. Report on Problem 18.—"On the methods of testing the protective power of paints used on metallic structures," by E. Ebert. Konigl, Bayer. Regierungsrat, Munich.

13. Annex to the Report on Problem 18.—"Raw and boiled linseed oil," by A. Grittner, chief analytical chemist to the Hungarian State Railways, Budapesth.

14. Report on Problem 23.—"Principles of a standard method of testing wood." Report by Professor Max Rudeloff, Gross-Lichterfelde-West. Appendix I, "Proposals regarding tests for ascertaining a practicable method applicable on a small scale to showing the resistance of wood to putrefaction"; and appendix II, "Tests to determine the durability of wood," by Dr. C. v. Tubeuf.

15. Report on Problem 34.—"Fixing a uniform definition and nomenclature of bitumen." Presented by the chairman of commission 34, Professor Dr. G. Lunge. Appendix, "Investigations of asphalt," by F. Lunge and V. Krepelka.

The price of Portland Cement has gone up to $4 per barrel at Tacoma, being an advance of $1 per barrel.

The Central Cement Co. of Independence. Kansas, is being formed to erect a Portland cement mill, seven miles west of Independence, Kansas. The following list of officers have been named: A. L. McCoy, president; J. A. McIntee of Kansas City, vice-president; Hampden Kelsey, secretary. The capital is to be $2,000,000. Five hundred and twenty acre tract has been purchased, known as the Spurgeon land.

FIREPROOF QUALITIES OF REINFORCED CONCRETE.

In a recent issue we drew attention to the fact that, because of its strength, resiliency, and monolithic or one piece construction, reinforced concrete was admirably adapted to resist the shock of earthquakes, and we strongly recommended the system for the rebuilding of San Francisco. We now wish to emphasize the fact that armored concrete is equally well adapted to resist the fierce heat of such a conflagration as that which completed the ruin of the city. Mention should first be made, however, of certain additional facts which have come to light regarding the behavior of reinforced concrete buildings that were exposed to the most destructive shocks of the earthquake. The first case is that of the bell tower of the Mills seminary, which, although it is some 75 to 80 feet in height, was not even cracked by the severe shaking to which it was subjected. The other two instances are to be found in Stanford university, where the museum building and Roble hall, both built of reinforced concrete, are standing practically intact amid the widespread ruin, and in some cases the absolute demolition, of the other buildings of the university, all of which were massively constructed with a special view to withstanding earthquake shock. Two wings built of brick had been added to the museum building since its completion. These were thrown down, while the concrete structure passed through the ordeal satisfactorily. Roble hall is built with concrete walls and floors of wood. The only damage to the building was due to the falling of a chimney, which broke through the floors, killing one of the inmates.

As to ability of reinforced concrete to withstand the test of fire, although there are no advices at hand to show that any such construction was put to severe fire test in San Francisco, enough has been learned in experimental tests made for building departments, and particularly in an exceedingly fierce fire which occurred to a concrete building in Bayonne, N. J., three or four years ago, to render it certain that buildings of this type would have passed through even the San Francisco ordeal satisfactorily.

One of the most conclusive tests by fire, loading, and water was that made last year by the bureau of buildings of New York city of a reinforced concrete floor, carried on two reinforced concrete girders, supported by four columns. The purpose of the test was to determine the effect of a continuous fire below the floor of four hours at an average temperature of 1,700 degrees F., the floor carrying a load of 150 pounds per square foot. At the end of four hours the red hot floor was to be subjected to a stream of cold water for five minutes, and then the upper side of the floor was to be flooded at low pressure. As the result of the test there was some flaking of the surface of the concrete, which did no material damage to the building. A stream of water knocked off the concrete from the bottom at one of the girders at the center, exposing the metal rods for a few feet, and there were some slight cracks of no material significance. With the exception of these defects, the whole floor system, in spite of the severe ordeal through which it passed, was found to be in excellent condition. The test was carried out under Prof. Ira H. Woolson of Columbia university, and on the satisfactory results achieved the system received the approval of the bureau of buildings of the city of New York, for whom the test was made.

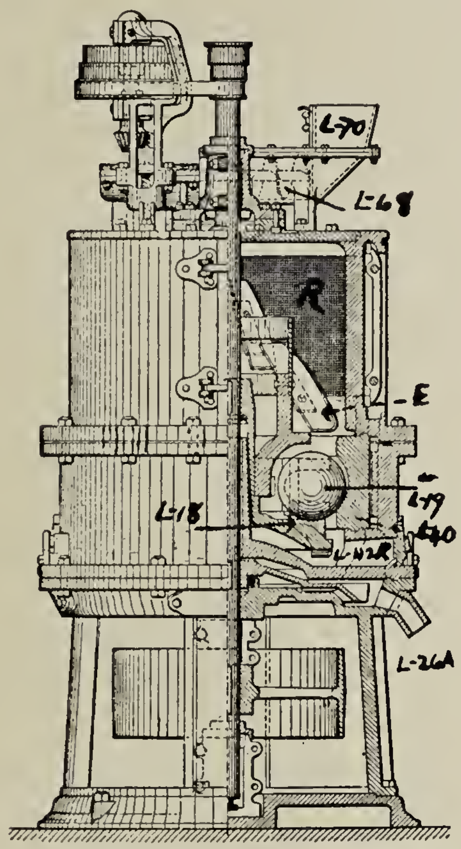
But the most severe test, the one which is generally accepted by engineers and architects as proving on a large scale the fire resisting qualities of reinforced concrete, was the fierce fire which burnt out the mill of the Pacific Coast Borax Company at Bayonne, N. J., on the night of April 6, 1902. The building, which measured 200 feet by 250 feet, was four stories high in the main portion, and the remainder consisted of a single story wing. The fire, which started from the bursting of an oil main and was fed by a large amount of inflammable material, was an exceedingly hot one, as was proved by the amount of fused cast iron from the machinery and copper from the dynamos and motors, which was found on the various concrete floors (themselves intact) after the conflagration. Everything that the building contained was completely burnt up, and nothing but the monolithic concrete structure remained. This was found to be in absolutely perfect condition, so much so that the building was put in first class shape at a cost of less than one thousand dollars. Evidence of the ability of such a structure to pass through a severe fire test and yet maintain its integrity was found in the fact that although the heat must have exceeded 2,000 degrees, the side walls, four stories high and 200 feet long, without any cross walls to tie them, were found, at the conclusion of the fire, to be absolutely in line, both vertically and horizontally.

The question of the extensive use of reinforced concrete in the rebuilding of San Francisco is greatly dependent upon the attitude which may be taken by the San Francisco labor unions, which hitherto have opposed the system so vigorously and successfully that of late but little of it has been used. We note, however, from press dispatches that the unions have signified their intention to suspend all restrictions which might hinder the rapid rebuilding of San Francisco, and it is to be hoped that this conciliatory and humane attitude will be extended to cover the important question of constructive materials. — Scientific American.

A NEW PULVERIZER FOR CEMENT, LIMESTONE, SAND, COAL, ETC.

By Richard K. Meade, Chemical Engineer, Nazareth, Pa.

The grinding proposition of a modern Portland cement mill is one of the toughest mechanical problems which now confronts the mechanical engineer. At a plant producing 1,000 barrels a day, over 500 tons of material must be ground to an almost impalpable powder every 24 hours. Three hundred tons of this quantity represent the raw material which must be reduced from pieces of stone as large as a man can handle to such a degree of fineness that from 95 to 98 per cent of the product will pass a 100-mesh sieve. The other 200 tons represents the slag-like clinker which must be pulverized so fine that at least 92 per cent of it will pass this sieve. The coal necessary to furnish the motive power for the machinery necessary to grind this quantity of material and the labor and material required to keep this machinery in operating order constitute the most important items in the cost of Portland cement manufacture. Consequently the modern wide-awake manufacturer is continually striving to secure greater efficiency out of the grinding machinery which he now has installed or is looking about for more efficient crushers and pulverizers to take the place of the latter.



FULLER-LEHIGH PULVERIZER.

The means now at hand for reducing material to a size passing a half inch ring screen are fairly efficient, consequently the search has largely been confined to the securing of a pulverizer to reduce the material from the size delivered by rolls and crushers to that necessary for the final product for the kilns or the market.

In view of the importance of the cement manufacturer's being posted on the best methods of pulverizing, I have undertaken below to describe a new mill which is giving unusually good results wherever tried and which promises to become an important factor in the grinding of cement, its raw material, and coal for their burning.

This mill is called the Fuller-Lehigh Pulverizer mill and is manufactured by the Lehigh Car, Wheel & Axle Works, Catasauqua, Pa. It is shown in the illustration. It consists of a horizontal ring or die, L 40, against which revolve four balls, L 19. The balls are propelled by means of a pusher L 18 A, upon which the balls also rest. The die, pusher and balls are made of chilled Swedish iron, and the latter weigh 112 lbs. each and are 9¼ inches in diameter. They revolve at a speed of about 210 revolutions per minute and hence press against the die with enormous (centrifugal) force. The material to be ground is fed into the hopper L 70, and from this into the mill by means of the screw conveyor L 68. The material entering the center of the mill falls down into the pan of the mill, situated below the die, and is thrown up from this, in between the rapidly revolving balls and the stationary die, by means of plow L 42 R. The material is pulverized by the rolling of the ball against the die, the pressure of each ball against the latter being over 1,600 lbs., the grinding action being similar to that of a mortar and pestle. The fully pulverized material is sucked upwards by the fans F, and blown through the screen R, falling down between this screen and the outer casing and being discharged from the mill at L 26 A. The coarse particles being too large and too heavy to be carried upward and through the screens by the fans fall back into the trough to be again thrown up between the die and the balls, etc. The plows and pushers are all attached to a central shaft which is driven from below by means of a pulley. This shaft extends through the top of the mill and actuates the feeding device. The feed to the mill and consequently the fineness of the product may be controlled in two ways—either by a slide on the hopper or by means of the stepped pulley, connected to the screw conveyor by gearing. The mill is provided with two screens—one, the inner, of one inch mesh and made of very heavy wire to protect the fine outer one. This outer screen on mills designed for pulverizing coal and rock is a 35-mesh screen and is made of No. 29 wire, while that on mills for cement clinker is 40 mesh and is made of No. 31 wire. The outer screen can be replaced with only a few minutes delay. Indeed the whole mill can be quickly dismantled. The mill is mounted on a heavy iron base, is entirely encased and is practically dustless when running. There is an opening, covered by a plate, in the top of the mill and a light may be lowered through this into the mill to examine the screens, balls, pushers, etc., at any time the mill is not running.

The fineness of the product delivered by the mill can be regulated by increasing or diminishing the feed to the mill. The size of the fine screen surrounding the mill also controls the fineness to some extent. It is possible with this mill to secure a product of almost any degree of fineness.

As will be seen by referring to the above description, the only parts of the mill which can wear are the balls, pushers, the die and the screen. As the die wears it conforms to the contour of the balls and the closer contact between the two results in a greater output of the mill.

The central shaft is not subject to sudden and constant jars and hence, will not crystallize and break. The parts subject to wear, of which the balls get the most, can be quickly replaced. The screens on clinker last on an average of 3 weeks and on the cement rock limestone mixture of the Lehigh Valley last at least 2 months. The balls and pushers wear from a minimum of one month on very hard clinker to two months on raw material and 3 to 4 months on coal.

Practically the only parts of the mill which have to be replaced are the balls, pushers and screens. The pushers are reversible, and hence, when worn on one side they can be turned around. The tire or die will last over two years. The actual cost of keeping one of these mills on clinker in repairs at one of the plants of this section amounted to $45.00 per month, on an average while on raw materials, the repairs only cost $16.72 per month average.

The mill requires about 35-40 horsepower to operate, and requires small floor space, hence shorter main shafts are required than would be the case with ball and tube mills. The mills take up even less space than any other pulverizing mill of similar capacity and require but a small amount of foundation. They may be placed in a row and driven from one line shaft, doing away with the loss of power in the counter shafts necessary to drive any considerable number of tube mills. They can be quickly set up. Cement plants having insufficient grinding capacity will find this an excellent mill to help out their other grinders, because the small amount of floor space which it requires will permit of its being "tucked away" in some corner where other grinding machinery could not be put, from lack of room.

The mill is also much less expensive than any other form of pulverizer. This is, however, but a small part of the saving effected by the installation of this mill. The small floor space which it requires, allows the construction of smaller buildings and foundations and shorter shafts and conveyors. There is also a saving in power by their use which economizes in engine and boiler installation.

The material should be prepared for this mill by means of a set of rolls just as would be done for a Griffin Mill; or Kominuters provided with coarse screens may be used for this purpose. The Fuller-Lehigh Pulverizer mill has been used in the Lehigh Valley for grinding raw material, Portland cement clinker and coal. At the plant of the Bath Portland Cement Co., the writer recently made a test of one of these mills grinding raw material (cement rock and limestone) with the result that the mill ground 4¼ tons per hour to a fineness of 95.9 per cent through a No. 100 sieve and 90.9 per cent through a No. 200 sieve.

At another time the mill ground 3.9 tons per hour to a fineness of 96.4 per cent through a No. 100 sieve and 91.9 per cent through a No. 200 sieve. The assistant superintendent told me that he considered these tests as representative ones and that he had frequently tested these mills under unfavorable circumstances such as very coarse or damp feed and had never found them doing less than 3½ tons per hour to a fineness of at least 93 per cent through a No. 100 sieve.

The importance of fine grinding of the raw material is now so well understood that it is hardly necessary here to more than emphasize the fact that the finer the raw material is ground the better. Fine grinding is not only necessary in order to produce a sound cement which will stand the boiling test, but it also makes the raw material easier to clinker and consequently increases the capacity of the kilns and decreases the coal consumption. As showing the necessity of fine grinding of the raw material the writer may mention the fact that in one instance which came under his observation it was found impossible to make the cement stand the boiling test when the raw materials were ground to a fineness of only 90 per cent through a No. 100 sieve, while no difficulty at all was experienced in doing this if the fineness of the raw material was increased to 95 per cent through this sieve, the composition remaining the same.

In the above test of the Fuller Mill, the feed to the mill was the product of a set of rolls and consisted of material, a large part of which would not pass a ½-inch ring screen.

A remarkable fact about the product of this mill is the relatively large amount of fine material passing a No. 200 sieve in comparison with that passing a No. 100 sieve. This has a very important bearing on its use as a cement pulverizer. The value of cement depends upon the amount of impalpable powder or flour it contains and generally speaking the greater the percentage of 200-mesh product for a given fineness through the No. 100 sieve the greater will be the quantity of flour in the cement. The gritty particles of cement have practically no value and any mill which produces fineness without flour is not suited to grinding cement.

As a pulverizer for cement a Fuller mill on a recent test run at the plant of the Phoenix Cement Co., ground 3,459 lbs. or 9.1 barrels per hour to a fineness of 92.2 per cent through the No. 100 sieve and 76.9 per cent through the No. 200 sieve. The clinker for this test was especially hard, well burned clinker and was prepared for the Fuller-Lehigh mill by ball mills. Wishing to confirm his theory that the product of this mill contained an unusually large amount of "flour," the writer had briquettes made of some of the cement ground during this test-run with the result that his views were entirely borne out, as the following unusually high breaks will show:

Briquettes 1 part cement and 3 parts standard sand:

	7 days.	28 days.
	416	438
	438	418
	392	429
	385	435
	402	403
Av.	406.6	424.6

At another plant the mill is grinding 12 barrels per hour to a fineness of 95.3 per cent through a No. 100 sieve and 81.6 per cent through a No. 200 sieve. This mill is working on the tailings from an air separator. At a test-run recently made to show how fine a product could be obtained with a Fuller-Lehigh Pulverizer, it was found possible to grind cement as fine as 99 per cent through a No. 100 sieve and 95 per cent through a No. 200 sieve. At this fineness the mill had a capacity of 4¾ barrels per hour. This test shows how valuable the mill would be to "pull up" the fineness of mills already installed but which will not give a product of the necessary fineness to fill standard specifications or for burning a sound cement without seriously cutting down their efficiency and increasing the wear and tear upon them. Probably no other mill could be economically run to produce such extremely fine cement. At the end of the four days run at this fineness, the mill showed no unusual signs of wear or strain.

The Fuller mill has been used continually upon coal at the Alpha Portland Cement Co. They consider it efficient and economical. Its being dustless also adds greatly to its value as a coal pulverizer, reducing the danger of fire and explosions. At this plant 3 mills are used to furnish coal for four 60-foot and six 80-foot kilns. This mill grinds on a minimum of 2¼ tons of coal per hour to a fineness of 95-98 per cent through a No. 100 sieve. The importance of grinding the coal for the rotary kilns very fine is not as well understood as it should be. Coarsely ground coal does not ignite promptly and consequently is wasted by incomplete combustion in the upper part of the kiln to carbon monoxide.

The writer has found as high as 3 per cent of this constituent in the stack gases of kilns fired with coarsely ground coal, while under normal conditions with finely ground coal the amount of carbon monoxide present is seldom over 1 per cent and may often be as low as 0.2 per cent.

As a final example of what the Lehigh-Fuller mill is doing, one of the new mills of the Lehigh District some six weeks ago put in one of these mills upon trial, grinding cement rock and limestone mixture. The manager of this plant told me he had repeatedly tested the output of this mill and had never found it less than 3½ tons per hour of a fineness of at least 95 per cent through the No. 100 sieve. As the result of his six weeks' trial of this mill he will throw out all of the machinery now installed in the "raw mill" and the coal mill to do the final pulverizing and replace them by Fuller-Lehigh Pulverizer Mills, using Kominuters to prepare for these.

CONCRETE BUILDING BLOCKS.

A remarkable fact, says the Oakland Industrial News, in connection with one of the more recent methods of construction—that of using hollow artificial building blocks—is that the largest building of this character in Alameda county was absolutely uninjured by the earthquake. We refer to the four-story paper box factory of Wempe Bros., at Fifth and Adeline streets. This structure has probably a larger percentage of window openings than any building of its class in the state, being designed especially with a view to affording ample light to all parts of the building.

There is a church on Waller street, San Francisco, near Golden Gate Park, built of building blocks, which also stood without any apparent damage.

GLASS FOR DRESSING WOUNDS.

Dr. J. L. A. Aymard, in a communication to the London Lancet, describes a new and successful method of dressing wounds as practiced in Johannesburg Hospital, South Africa, which consists of using a piece of glass with the sharp edges ground down on a grind stone and washed in a solution of carbolic acid and applied to the wound instead of a bandage. Ordinarily, thick window glass or an ordinary open faced watch crystal will answer.

This treatment will cause the wound to heal without leaving a scar, while the wound heals much quicker than when lint and bandages are used. While the wound may be examined without removing the dressing.

The Ideal Concrete Machinery Co., of South Bend, Ind., is sending out a handsome booklet, 11 by 14 inches. The first page contains portraits of the officers of the company followed by illustrations of the office, factory and machinery produced by the company. The illustrations are of unusual size and well executed. Besides the Ideal Hollow Concrete Block Machine, the company has on the market a variety of The Ideal Special Sill and Lintel Machine made in a variety of sizes which are capable of producing almost any size or style of sill or lintel required in building construction.

Fairbanks, Morse & Co., San Francisco, Cal., now occupy temporary headquarters at 969 Broadway, Oakland, Cal., until they are able to return to their permanent location in San Francisco, where they were recently burned out in the disastrous conflagration following the recent earthquake. Meanwhile, their many customers are receiving the usual prompt attention for which the house is famous and they have never ceased the sale of their well known specialties: Scales, Steam Pumps, Motors, Generators, Windmills, etc.

Dodge & Day, engineers, of Philadelphia, have been commissioned by the Kerr-Murray Mfg. Co., of Fort Wayne, Ind., manufacturers of gas works machinery and gas holders, to design, erect and equip a new plant. The present factory is much too small for the requirements of their business and the Kerr-Murray Co. have secured a plot of 30 acres close to Fort Wayne. Preliminary work is about completed and construction work will be started at once.

H. P. Elwell, a promoter, has a project for a new Portland cement plant at Dallas, Tex., to be located five miles from the court house. John A. Sinclair is slated as the local representative of the new company.

T. W. Smythe has resigned the position of manager of the Alabama Portland Cement Company of Demopolis, Ala. Mr. Moore of New York has taken the position vacated by Mr. Smythe. Sallie Simon, assistant chemist, has resigned to take a position with the Ironton Portland Cement Company of Ironton, Ohio.

The power house for the Art Portland Cement Company at Kimmell, Ind., is to be constructed of concrete blocks to be furnished by Andy Revick of Syracuse, Ind.

The Logan Portland Cement Company project at Fenton, Mich., is being revived by Detroit capitalists.

The Shenango Portland Cement Company charter has been granted. Capital stock, $900,000. Its plant is under construction at Fogelsville, Pa. The incorporators are Colonel H. C. Trexler, E. M. Young, George Ormrod, C. A. Matcham, and George G. Sykes.

Fenton, Mich.—Edward Walker, aged 28, unmarried, was scalded to death and Andrew Wilson badly scalded by the blowing out of a flue of the boiler of the Ætna cement plant on May 8. The Ætna cement plant employs sixty men and has been in operation night and day. The plant is closed down during repairs to the boilers. The property damage is very small.

Efforts are being made to organize a Portland cement company at Humboldt, Allen county, Kansas.

The Kansas Portland Cement Company's new plant at Independence, Kan., expects to start up early in June.

C. A. P. TURNER, M. Am. Soc. C. E.

CONSULTING ENGINEER

816 Phœnix Building, MINNEAPOLIS, MINN.

Bridges, Buildings,
Concrete-Steel Construction.

REINFORCED CONCRETE IN THE EARTHQUAKE.

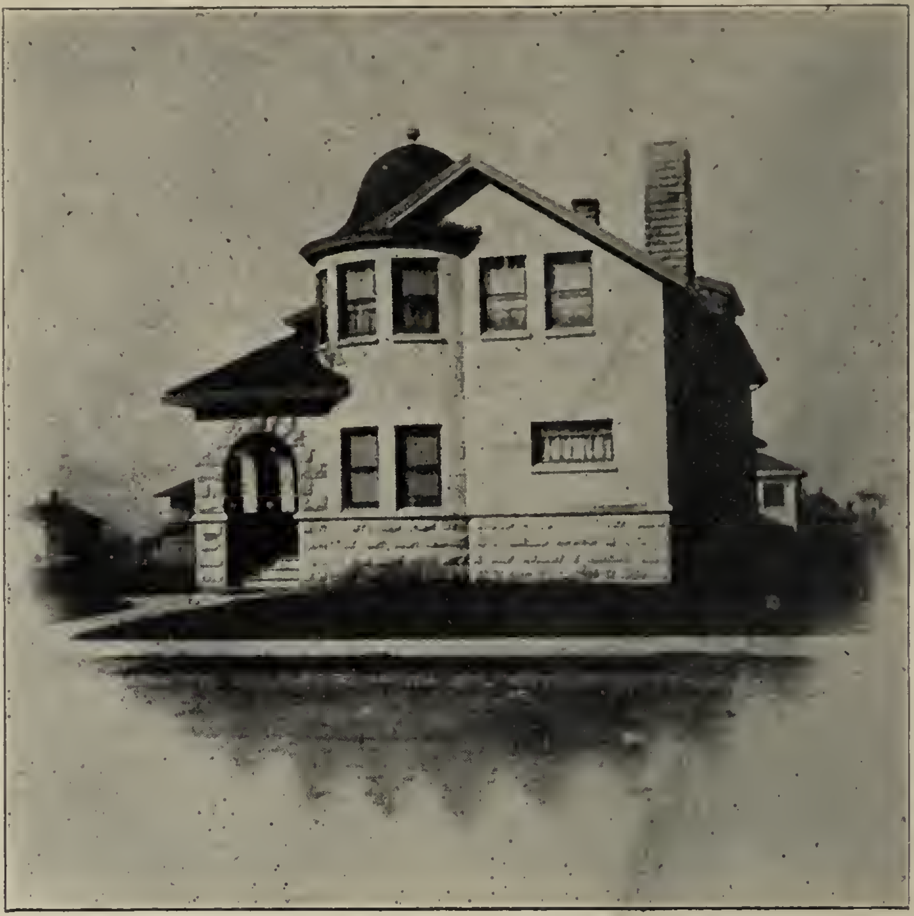
BY WM. B. GESTER, C. E., BERKELEY, CAL.

The architects and engineers of the world are gathering with the most intense interest notes of every fact and every experience possible in connection with the late disastrous combination of earthquake and conflagration in and about San Francisco.

There will be very many records of happenings noted by dwellers in structures of wood and brick and stone, and in those of steel frames, and the lessons derived therefrom should be numerous and valuable.

Inasmuch as my own experience of the tremblor was had within the walls of a reinforced concrete building, it may be of interest to many to have a record of the sensations felt and the effect of the shaking upon the structure.

The seismic disturbance in this district was probably just about as violent as it was in the university grounds, where accurate measures were automatically recorded. The vertical height of the earth wave is said to have been one inch. The intervals of the waves were about one second, and the disastrous portion of the disturbance lasted about one minute and a half. So this particular piece of the earth's crust was lifted and dropped vertically a distance of one inch about a hundred times. To the uninitiated this may not carry an idea of much impressiveness, but to all to whom it was an experience it was one of awe, compelling a peculiar profound consciousness of infinite human insignificance and helplessness. In the house in question, those of us who could hold ourselves to side or head or foot of our beds did so; but one of the inmates, an active, athletic young fellow weighing about 170 pounds, was thrown by the shock from his bed to the floor. Scrambling to his feet to reach the door of his room, he was immediately landed upon his hands and knees, and thence flung into a huddled heap into the angle formed by floor and wall. Pictures, furniture, the chain-hung electroliers, everything not fastened to floor or wall, was put into instantaneous motion, the commotion and din being indescribable.



Residence of Wm. B. Gester, Berkeley, Cal. Reinforced Concrete and Litholite Stone (Stevens Cast Stone).

The building itself, however, came through the racking with so small an amount of damage that it serves as an example of the value of a simple type of ferro-concrete construction.

The foundation walls, having a base 20 inches thick, are constructed of well tamped, 1-2-5 concrete, made with domestic Portland cement. The walls above the foundation to the line of the first floor joists are 12 inches thick, and above this line they are but 8 inches thick. Of this thickness 2½ inches is a veneer of blocks of cast concrete known as "litholite" or "Roman stone," or "Stevens' cast stone," thoroughly anchored by corrugated galvanized iron ties to the main body of the wall. This "Roman stone" is made of poured concrete, a one to four mixture of Pacific Portland cement and finely crushed rock from the California City quarries in Marin county.

The main wall is a well rammed 1-2-5 concrete, reinforced with vertical ¼ inch iron rods, spaced 16 inches apart and tied horizontally with heavy baling wire. The outer walls and the arches of the vestibule are of solid blocks of "Roman stone."

Except for the arched vestibule, the structure is a monolith, and the effect of the temblor is such as might have been expected. The whole building rose and fell as a single mass, without creak or groan or complaining strain, but with a very solid impact it came down after every lift, chunk-chunk-chunk, as if it had been a great cast iron box.

The following damage was suffered: One chimney, not the large one seen in the illustration but a lighter one in the rear of the building, was twisted just above the roof line so as to require rebuilding. Inasmuch, however, as this chimney was not braced above the roof and differed but little in construction from thousands of others that suffered similarly, no particular deduction can be drawn.

The pointing of the keystones only in all the arches of the vestibule was cracked so as to require repointing. Not a single other joint in the building was disturbed or injured in the least, and not a stone was broken or cracked.

The joints of the keystones that were loosened were so affected because of lack of weight above the arches, there being but one course of stone between the top of the arches and the comparatively light portico roof.

The principal deduction to be drawn therefore from this particular experience is that reinforced concrete wall construction in its simplest form, if only well done, is proof against a more than ordinarily severe earth crust disturbance, and that with proper anchorage and honest mortar joints a stone veneer will be held to it in absolutely perfect condition.

An illustration of the building accompanies this article. It is a "story and a half" dwelling, located in the eastern portion of Berkeley, Cal., a few blocks south from the University of California.

CONCRETE CONSTRUCTION AND THE SAN FRANCISCO DISASTER.

Just at this time as a result of the San Francisco disaster, there has arisen considerable discussion over the relative merits of various methods of construction, and particularly so in regard to skeleton steel, and the fact that it stood in most cases when other methods failed.

It is but due to say that in almost every instance, where the skeleton steel structure stands practically uninjured, it is where the steel was covered with a coating or jacket of concrete, and when the building was provided with reinforced monolithic concrete floors and foundations. At the same time there were buildings that stood beside those now standing that were also constructed on steel skeleton methods, but provided with floors and coverings of clay tile and brick; materials which are fireproof in so far as burning is concerned, and yet the steel skeleton is entirely wrecked. The writer went to San Francisco the day of the earthquake and examined into the conditions carefully, knowing there must be a cause for such difference in results, and really the cause is so apparent that it does not require a training along engineering lines to discover them.

In so far as the structural steel itself is concerned, it is the same in all the structures referred to, and the resistance to destruction being greater in one than in the other standing by its side is therefore due to other conditions than the steel, and it is found in the materials composing the floors and coverings.

In the case of concrete, the material being plastic, when placed, it enters into all crevices, indentations and holes, it adheres to the steel and forms a monolithic slab, imparting to the steel members rigidity and practically eliminating the so-called "elasticity" of the building. On the other hand, in the covering the steel and the placing the floors with bricks and hollow tiles, the material is put into position in blocks, and the floors are held in place by the pressure of one block against another; the material does not enter into joints or crevices; does not fill solidly against and does not adhere to the steel members, and is not monolithic and has practically no control over the elasticity or flexibility of the building; consequently in case of earthquake or sudden shock the edges of the tiles grind against each other, and, being brittle, scale and break and the structure is wrecked. In every instance where the steel skeleton was destroyed it was by shear. The parts are joined by bolts or rivets, and the withing action sheared off the bolts and rivets and the members fell apart.

I have heard many statements made that the steel skeleton buildings stood because they were more "flexible" or "elastic" than others; this is entirely erroneous; as a matter of fact, it was this very flexibility which destroyed those that were wrecked, the degree of sway to the top of a building from the undulation of the earth under its foundation is greater or less in proportion to its height, and the sway is accentuated in proportion to its flexibility, the top of the building swaying farther than the bottom, before it returns to an equilibrium, the second undulation from the bottom going upward meets the returning motion from the top and at whatever point these counter-forces meet there is danger, and the more flexible or elastic the building the greater the danger. It is the meeting of these forces traveling in opposite directions that toppled over the upper one or two stories, as was done in many cases, while, on the other hand, it was the rigid monolithic construction of the other and much higher buildings that reduced the sway and held them nearer to the alignment, thus preventing their destruction.

The results abundantly prove that buildings having monolithic construction, reducing the equation of elasticity, stand, while those constructed of individual blocks or pieces having no control over the elasticity or flexibility are destroyed, and this is greatly emphasized by the fact that many of the buildings constructed monolithically, as the Call, Haywards, Merchants' Exchange, St. Francis and others, which were the tallest in the city, and consequently subjected to the greatest strain, are apparently uninjured in frame, and although all of them were swept by fire, in no instance has the concrete been so injured as to require its removal.

The question has been raised as to how reinforced concrete construction will stand the shock of earthquakes. Unfortunately for the purpose of obtaining results on this point in the city of San Francisco, there were no building constructed on this method as a whole. In the Monadnock building the intermediate beams are of reinforced concrete, none of which show any injury whatever. There are instances, however, outside of San Francisco and within the earthquake belt which are good examples. The central portion of the Stanford Museum at Palo Alto is built of reinforced concrete (the two wings lately constructed and which were built of brick and lumber were destroyed). The central part has a dome in the center of 45 feet span, beams 72 feet long and columns 40 feet high, and stands without damage, although it was constructed about fourteen years ago and without any stirrup system. Another at Burlingham, near Palo Alto, stands without injury. Another instance is the Pacific Borax Co.'s very large five-story building, also built about fourteen years ago without any system of stirrups, and standing on the marches at Alameda point opposite Oakland, is not damaged.

In constructing a reinforced concrete building the steel is entirely protected from heat by being embedded in the concrete, there are no bolts or rivets to shear off, the bars being woven throughout the structure.

It is a well-ascertained fact that the ratio of expansion of concrete and steel under heat is the same, and therefore in the case of a fire the adhesive bond of the concrete to the steel is not broken. This seems to be proven beyond question by the fact that in one of the buildings treated with concrete and which passed through the San Francisco fire is the concrete stripped from the steel.

The results shown by the disaster at San Francisco and other points seem to prove this method of construction to be the most rigid and reliable under the extreme stresses of both earthquake and fire.

T. F. Osborn, C. E.

Los Angeles.

READING CEMENT COMPANY TO REORGANIZE.

An informal meeting of the stockholders of the Reading Cement Company was held at Reading, Pa., for the purpose of arriving at some method of reorganization, but, although various plans were discussed, no action was taken in the matter. About twenty stockholders were in attendance, representing about $100,000 of the $170,000 issue.

The property of the company has been in charge of a trustee in bankruptcy, who made a report of the condition of affairs. Mr. Coogan of the Alpha Cement Company, who had been engaged to look over the property of the company, reported the condition of the quarries, the plant, kilns, and operative powers, together with estimates of the possible cost of the product.

Unless some new plan is devised, the property will be offered at public sale by the trustee.

TEST.—CONCRETE BLOCKS, WATER ABSORPTION.

Effect of Medusa Water-Proof Compound.

Concrete blocks 8x9x16 inches, of Cement 125, Limestone Screenings 600,—1 to 4⅘, by weight, with and without medusa water-proof compound

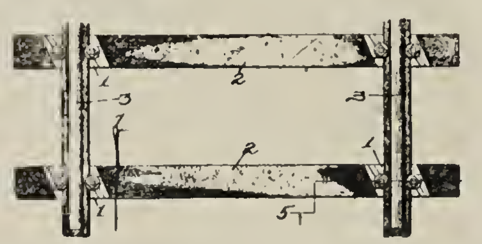
Made July 1 to 4th, 1905; exposed to weather 9 months, then allowed to become air-dry in laboratory; placed in water 2 inches deep, and weighed at 1, 2, 3, 4 and 24 hours.

Amount water-proof compound % of weight of cement	Water Absorbed, % Total Weight				
	1 hr.	2 hrs.	3 hrs.	4 hrs.	24 hrs.
No. 1.— Water-proof compound .0	5.31	6.20	6.20	6.64	7.12
No. 2.— " " " 1%	0.83	1.24	1.24	1.24	1.65
No. 3.— " " " 2%	0.85	0.85	0.85	1.27	1.27

The above *test* is more *severe* than the *hardest* rainstorm.
No. 1 test carried no water-proofing.

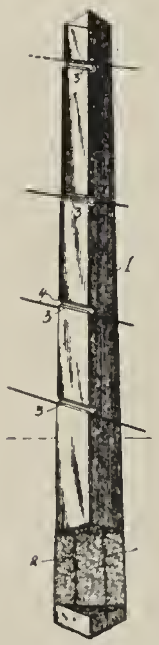
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

816,645. Railway-Tie Plate and Means for Securing Rails Thereto. Henry H. Clough, Elyria, Ohio. Filed March 14, 1904. Serial No. 197,965.



Claim.—1. The combination with a tie-plate, of means for securing a rail thereto, said means comprising a slot formed in said tie-plate and disposed outside of the rail-seat thereon, a raised portion on said tie-plate at the side of said slot remote from the rail-seat, a clamping-bar and a clamping-bolt, substantially as described.

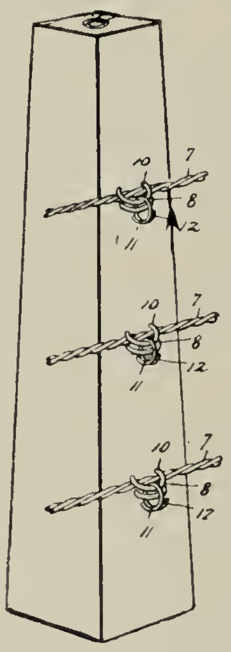
816,715. Cement Fence-Post. Clarence Dodd, Waterville, Ohio, assignor of one-half to Frank Roach, Waterville, Ohio. Filed Nov. 1, 1905. Serial No. 285,379.



Claim.—1. A concrete fence-post having a series of cavities extending transversely across one of its side faces, one above the other, and metal linings for said cavities, said linings having, respectively, narrow elongated openings disposed flush with said face of the post.

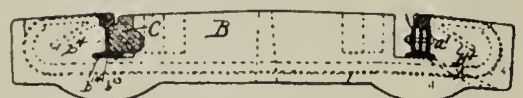
2. In a concrete fence-post, a series of metal members of the width of the fence-post, said members having, respectively, a cavity with an elongated mouth and being embedded in the post with the mouth disposed transversely of and flush with one of the faces of the post.

817,017. Cement Fence-Post. John A. Stransky, Pukwana, S. D. Filed Aug. 18, 1904. Renewed Feb. 27, 1906. Serial No. 303,200.



Claim.—A fence-post comprising a body portion having a reinforcing-core, a plurality of wire-supporting clips each having an intermediate portion thereof, coiled to form a pair of spring-jaws and its opposite ends engaging the core, and retaining members engaging the spring-jaws of the clips.

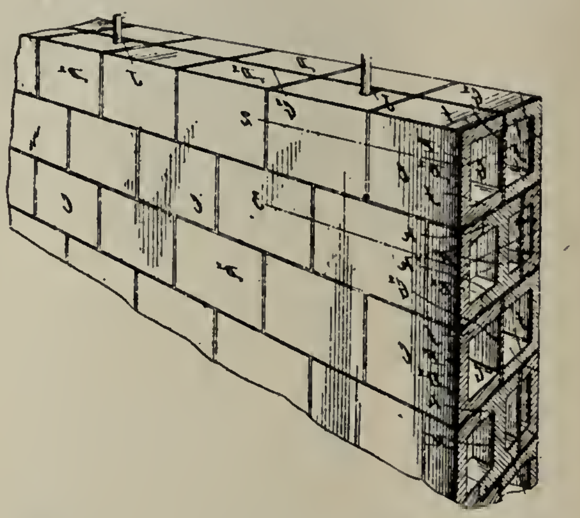
817,169. Railroad-tie. Joseph Freund, Beaver, Pa., assignor to Henry Hoenigsberger, Bensonhurst, Long Island, N. Y. Filed Aug. 12, 1904. Serial No. 220,538.



Claim.—1. A railroad-tie having a reinforcing-bar embedded in the tie and extending under the rail-base and having the upturn outside said base the tie and upturn being arranged to extend up to the upper part of the rail.

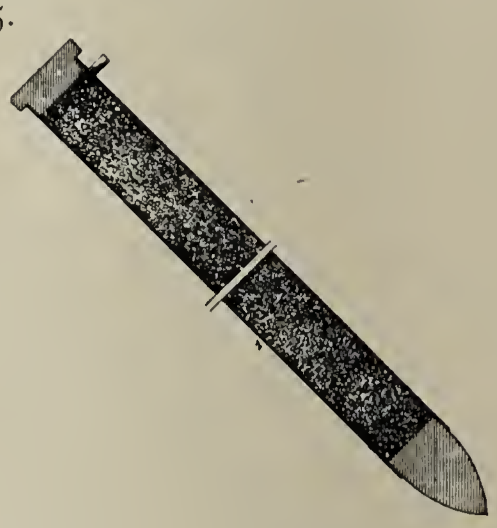
2. A railroad-tie, having a reinforing-bar embedded in the tie, and extending under the rail-base, and having an upturn outside said base, said bar including the upturn being arranged to contact the outside of the upper part of the rail for bracing the rail.

817,478. Building construction. George F. Fisher, North Tonawanda, N. Y. Filed Jan. 30, 1905. Serial No. 243,316.



Claim. A hollow building-block consisting of a plurality of sections, each block comprising facing sections having depressions on their inner sides, and an intermediate section having depressions on both sides, the depressions of the intermediate section being in opposing relation to the depressions in the facing sections, thereby forming an air-space between the intermediate section and each facing section.

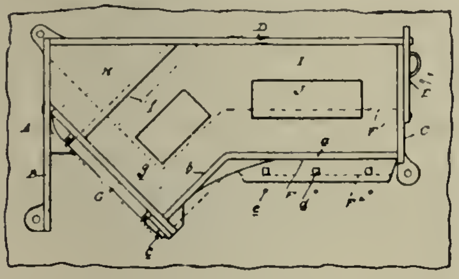
817,595. Setting concrete piles. Frank Shuman, Philadelphia, Pa. Filed July 26, 1905. Serial No. 271,325.



Claim.—1. The mode herein described of setting a concrete pile, said mode consisting in first surrounding the mass of concrete with a pipe, driving the two as a unit, and then withdrawing the pipe.

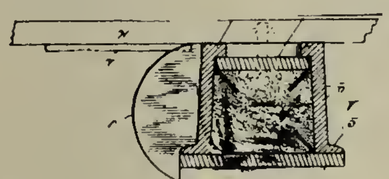
2: The mode herein described of setting a concrete pile, said mode consisting in filling a pipe with plastic concrete, prevening escape of the latter at the top of the pipe, driving the pipe thus filled, and then withdrawing the pipe and leaving the mass of concrete in the opening.

817,661. Machine for molding building-blocks. Levi P. Normandin, Jackson, Mich., assignor to William F. Cowham, Jackson, Mich. Filed Oct. 17, 1904. Serial No. 228,837.



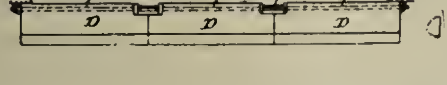
Claim.—In a mold, the combination with a bed, of a rectangular mold-frame comprising articulated sides, a bottom plate adjacent to said sides, and a complementary side for said frame having a portion extending over said bottom plate between the parallel articulated sides and adapted to be rigidly attached to said bed in different positions of adjustment in relation to the third side, substantially as described.

817,670. Method and machine for forming cement posts. Alonzo P. Robertson, Rochester, Mich., assignor to William F. Cowham, Jackson, Mich. Filed May 4, 1905. Serial No. 258,848.



Claim.—The herein-described process of forming composite cement and metal posts which consists in placing a layer of the cement in the bottom of a mold, tamping the cement to free the same from the sides and form inclines from the lower corner of the mold, then placing metallic strips upon said inclines, then completely filling the mold and striking off the same, whereby said metallic strips will be embedded in the cement so as to extend diagonally inward from the corners of the post.

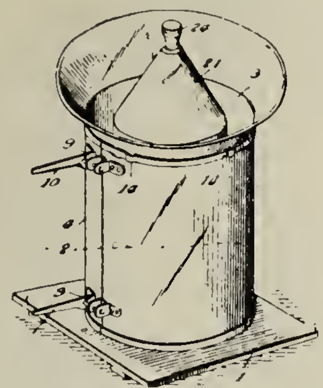
818,884. Sectional girder and column of reinforced concrete. Rudolf Grimm, Vienna, Austria-Hungry. Filed Jan. 18, 1906. Serial No. 296,660.



Claim.—1. A girder or column formed of a plurality of recessed sections, metallic inlays arranged in each of the sections and having screw-threaded ends projecting into the recesses of the sections, and means arranged in the recesses of the sections and engaging the screw-threaded ends of the inlays for connecting the sections together.

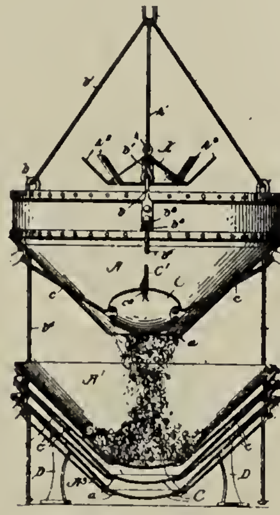
2. A girder or column formed of a plurality of sections, metallic inlays arranged in each of the sections and having screw-threaded ends projecting from the section, and right and left hand threaded nuts mounted upon the screw-threaded ends of the inlays for connecting the sections together.

818,727. Portable mold for tiling. Francis M. Wiltrout, Corunna, Ind. Filed Nov. 2, 1905. Serial No. 285,559.



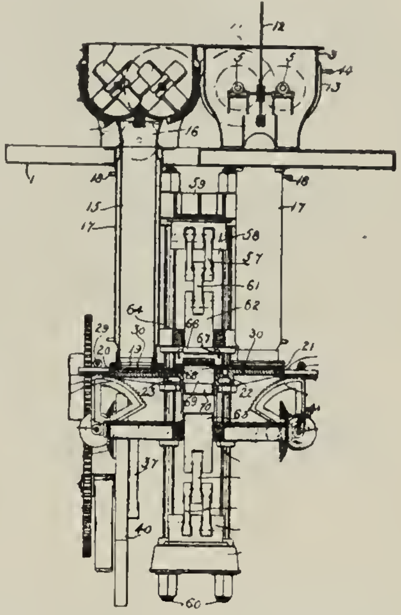
Claim.—A device of the character described comprising a pallet, an upwardly projecting flat cylindrical flange or ring carried by the top thereof, an outer shell or casing encircling said flange, said outer shell or casing being formed in sections, ears mounted on the sections and having openings therethrough, a pintle extending through the openings in the ears whereby the sections are pivotally connected at their rear edges, means for locking the sections in position at their front edges, a core comprising one piece of resilient material bent to form a cylinder and resting upon the pallet within the ring or flange, means for locking the edges of the core together, a conical cap for the core, and a hopper removably mounted on the outer shell or casing.

818,929. Concrete-mixer. Charles R. Weaver, Baltimore, Md., assignor to Peter C. Hains, Jr., U. S. Army, New York, N. Y. Filed Nov. 25, 1905. Serial No. 289,000.



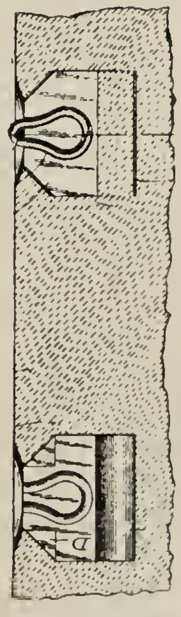
Claim.—1. In a concrete mixing and handling apparatus, the combination of a plurality of hoppers having bottom openings and adapted to be nested one within the other, and means for connecting said hoppers in series to permit them to be successively raised from their nested position and cause the material to pass successively from one hopper to the other as they are raised.

819,005. Plastic-block machine. George W. Crichfield, Jersey City, N. J., assignor of one-half to William T. S. Crichfield, New York, N. Y. Filed March 24, 1905. Serial No. 251,859.



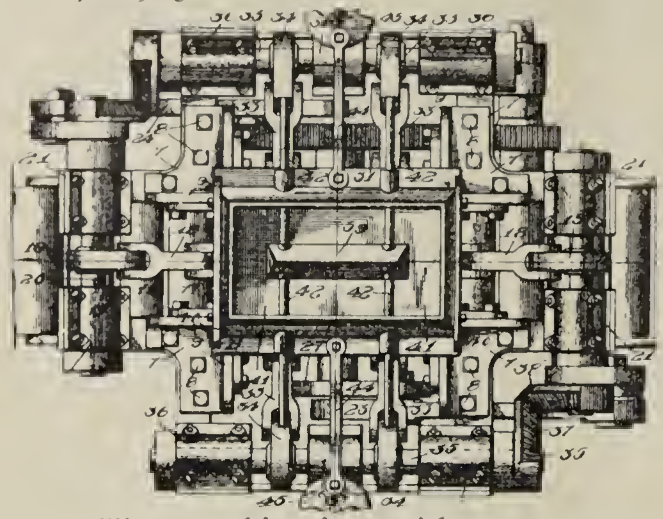
Claim.—1. In a plastic block machine, the combination with a plurality of mixing-chambers and mixing devices wherein different plastic compounds may be mixed separately, of movable molds, mold-operating mechanism whereby different molds are moved to and from different mixing-chambers enabling the molds to receive different compounds, the said mechanism being adapted to arrange the molds and contents contiguously, and a press constructed to press the contents of different molds together causing them to cohere and form a single body.

817,762. Staple-receiving clip for concrete posts. Henry Giessel, Wapakoneta, Ohio. Filed March 6, 1905. Serial No. 248,720.



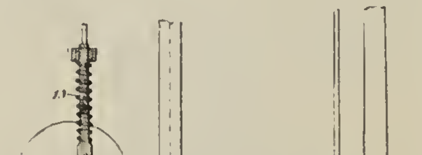
Claim.—A staple-receiving metallic clip for concrete fence-posts comprising a member adapted to be embedded in the post and having an enlarged inner end, one end of said member being substantially flush with one face of said post, said member being provided with a substantially U-shaped passage adapted to receive the staple and having converging ends, the mouths of which are disposed in the end of said member which is flush with one face of said post.

817,964. Machine for making cement blocks and the like. Willard P. Elmore, Adrian, Mich. Filed Feb. 27, 1905. Serial No. 247,460.



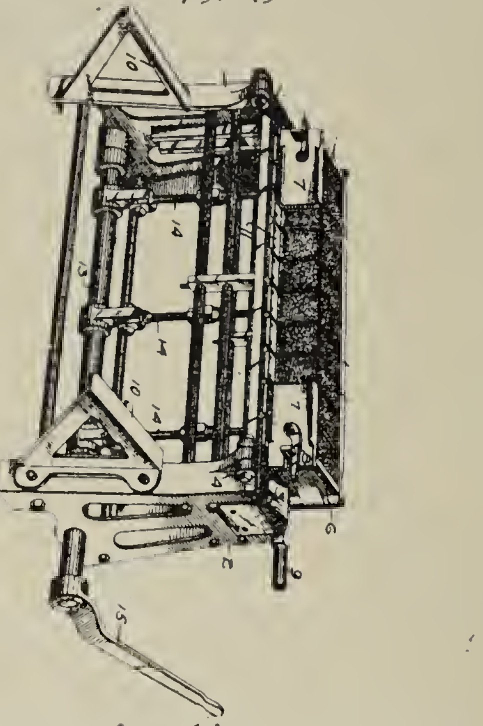
The combination with a pressure-chamber, comprising laterally-movable side and end walls, means for moving the same simultaneously in and out, a top comprising separable portions, a bottom, and a vertically-reciprocating carriage for carrying the same, means for shifting the separable portions of said top, means for moving said side and end walls in and out, and means for reciprocating said carriage, said mechanism being arranged to begin the downward reciprocation of the carriage shortly after the pressure-walls begin to move outwardly.

818,158. Machine for manufacturing pipes or conduits from cement, etc. Claude Girardot, Vitry-Le-Francois, France, assignor to Societe J. et a Pavin de Lafarge, Viviers, France. Filed Jan. 3, 1905. Serial No. 239,509.



Claim.—1. A molding-machine of the class described, comprising a rotary table, a mold mounted on said table comprising a casing and a core, a shaft carrying said core and extending through the latter and being detachably connected to said table for rotating the same, a platform loosely mounted on said shaft, ramming mechanism carried by said platform, a gage carried by said platform for adjusting the height thereof in accordance with the height of the material in the mold, and means carried by said shaft for expanding and contracting the core.

818,286. Process of molding concrete bricks or blocks. William Porten, St. Paul, Minn. Filed Sept. 20, 1905. Serial No. 279,249.



A process of making a concrete brick or block which consists in placing a thin layer of fine sand and cement mixed in suitable portions in a mold having a hard smooth floor to form a finished facing on the block, and then filling up and tamping the mold with a mixture of coarser sand and proportionately less cement whereby a softer, more pervious backing will be formed, substantially as described.

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Chemist, college graduate with 7 years practical experience as chemist and superintendent of Portland Cement plants, desires to make a change. A 1 references. Address "B. C.", care Cement and Engineering News.

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Superintendent for large Portland Cement plant in the Middlewest; must be good engineer. Should understand both wet and dry process. Give reference and salary expected. Address P. O. Box 84, Detroit.

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Solves the problem of making moisture-proof hollow concrete blocks.
Does away with furring and lathing; plastering done direct on the blocks.
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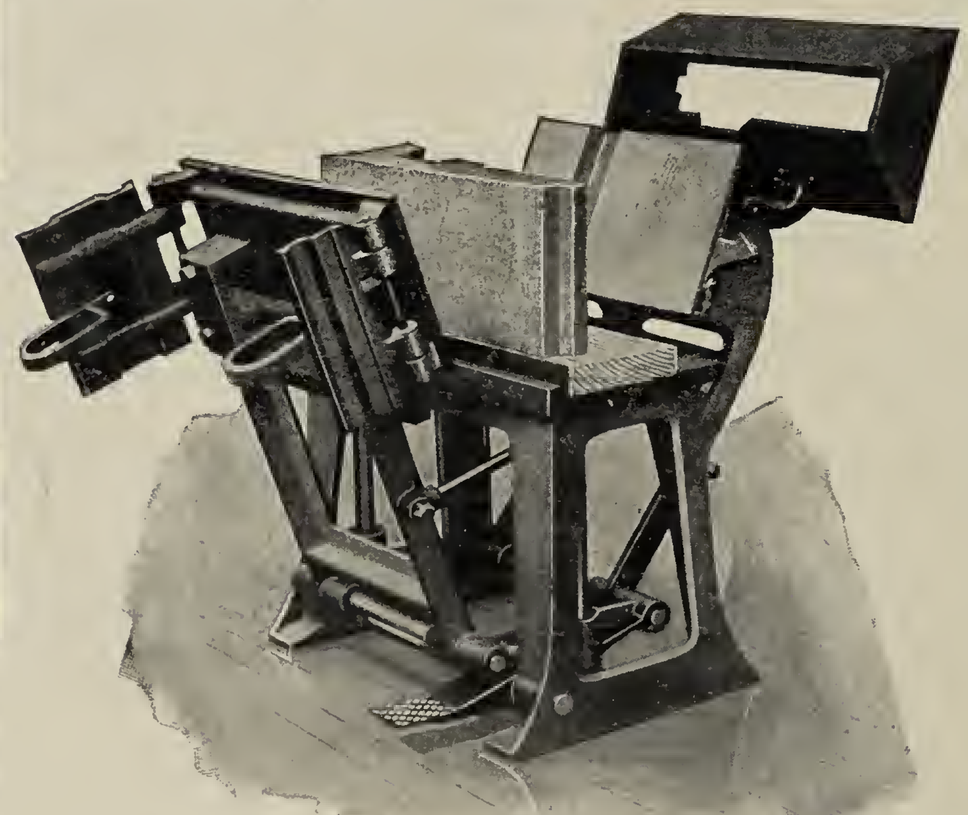

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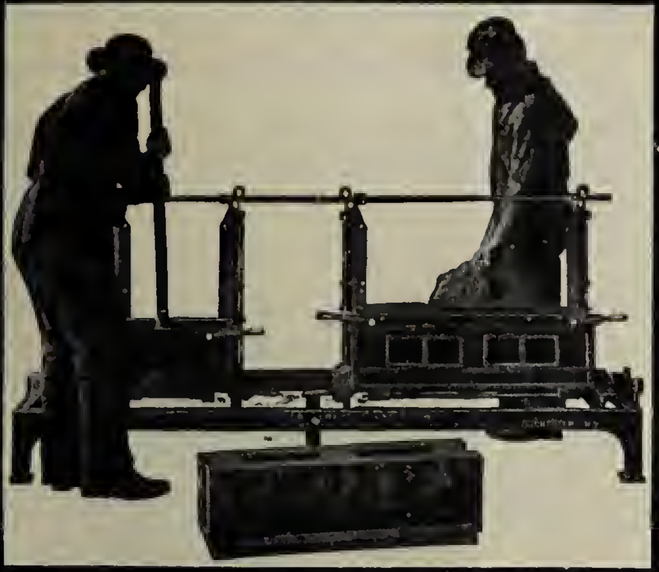
ARCHITECTS' AND ENGINEERS' HANDBOOK OF

Re=Inforced Concrete Constructions

172 pages. Illustration and Diagrams 217 Pages.
By L. J. MENSCH, C. E.
Cloth, $2.50, Paper, $2.00, Sent Postpaid.
Cement and Engineering News,
226 La Salle Street, CHICAGO, ILL.



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But clay and clay differs in dignity whose dust is both alike. Shakespeare

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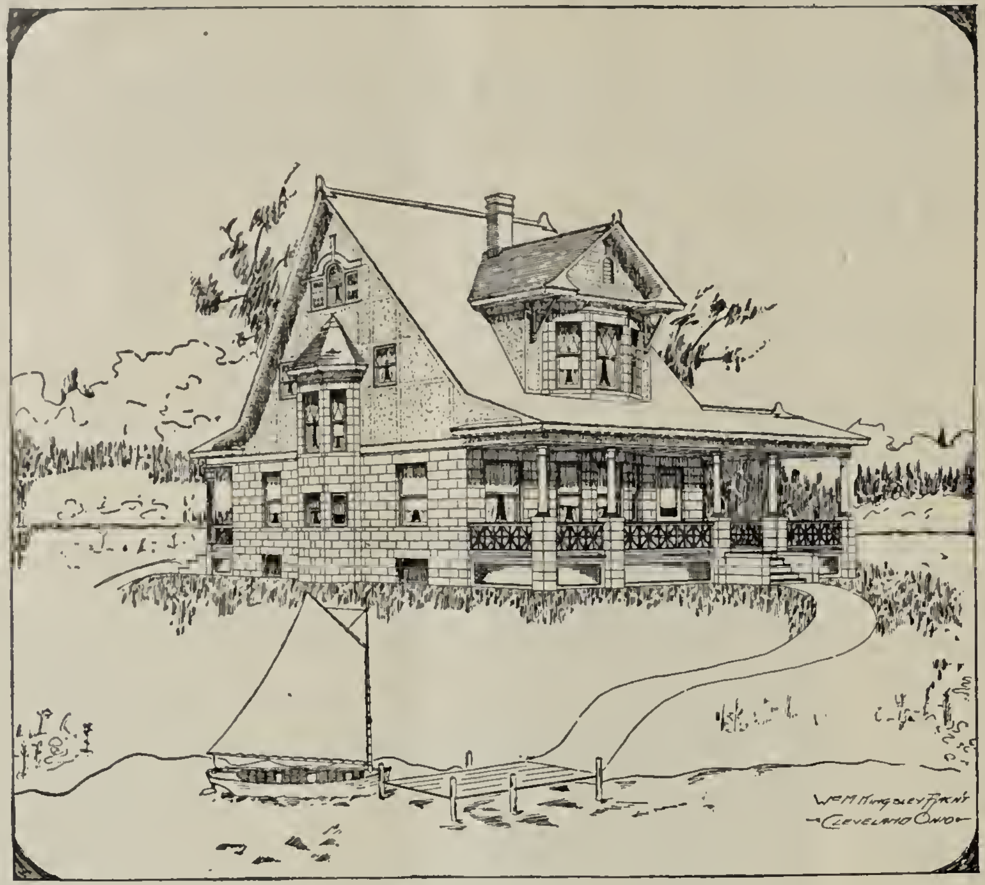

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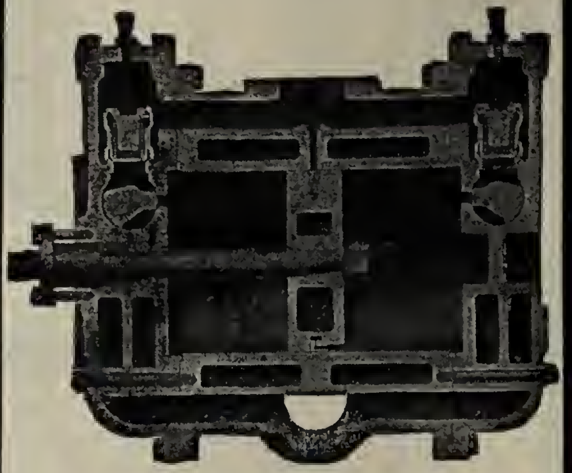

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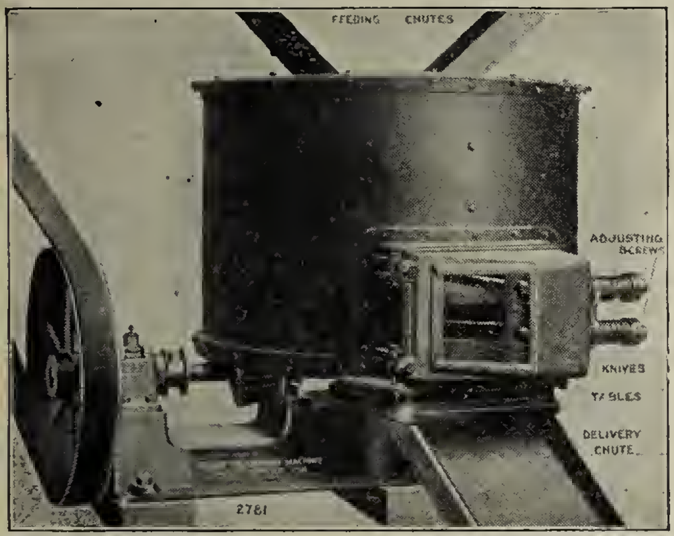

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1 9' Bonnot Dry Pan
1 Link Belt Machinery Co. Coal Crusher
1 Blake Jaw Rock Crusher
4 50" x 16' Bonnot Wet Tube Mills, complete
2 Schoellhorn Hammer Pulverizers
1 Bonnot Pug Mill
11 Bonnot Slurry Pumps
5750 9" Blocks for lining 72" Rotary Kilns

These blocks were made by Harbison-Walker Refractories Co., Stowe Fuller Co., and Burns Fire Brick Co.

4 Stacks for Rotary Kilns, 42" diameter, 75' high, 10 and 12 ga.
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Mechanical Agitators, complete for 10 Slurry Tanks and 2 Slurry Vats.
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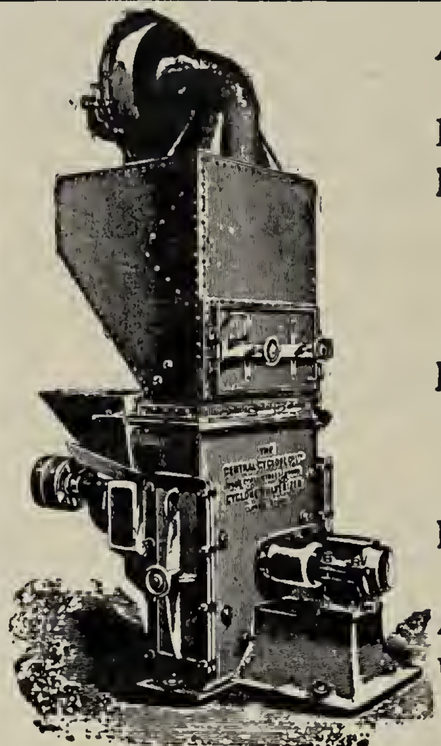

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CEMENT FACTORY

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General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.

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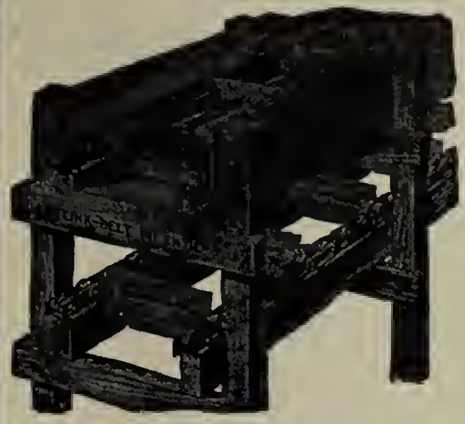
COAL CRUSHERS and SCREENS
Address Cement Department.



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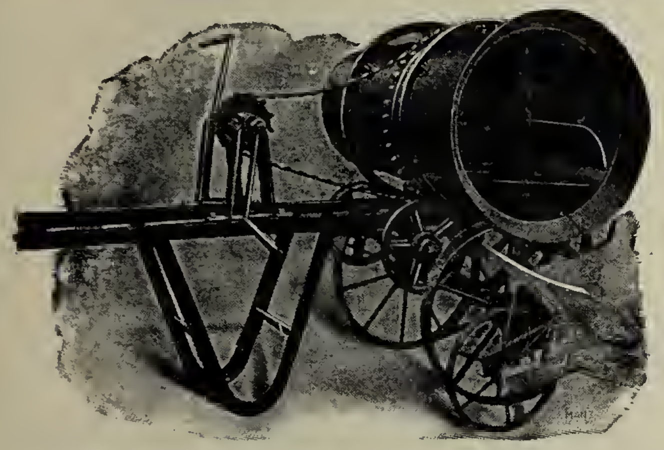

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FOR
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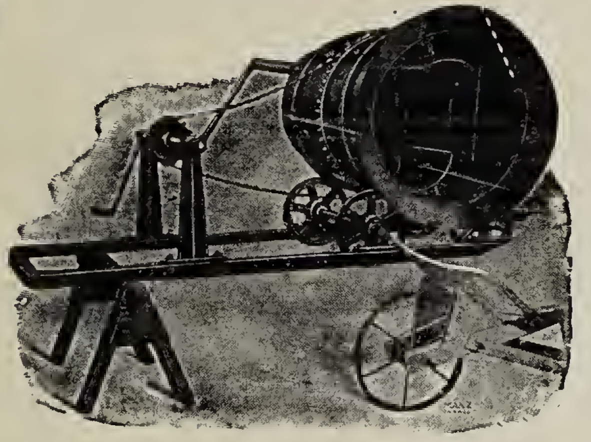

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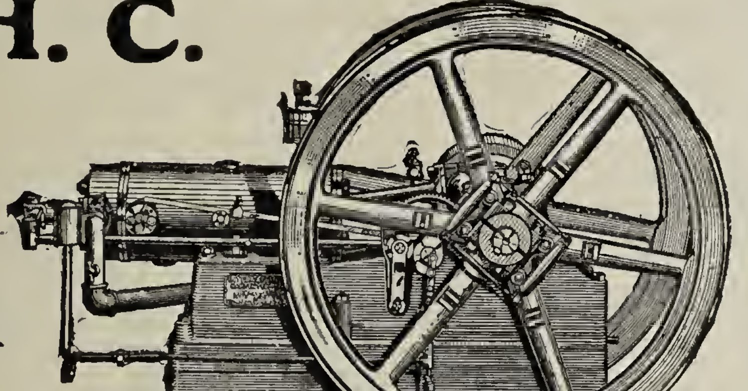
ON THE WORK



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Suppose you are entering upon cement work—that boundless new field.

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Take the running of cement and concrete mixers. Nothing could be better suited to your wants than an I. H. C. Gasoline Engine.

You must have and you get in an I. H. C. Engine—
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Best of all, you don't have to be a machinist to operate it—anybody of just ordinary judgment by using just ordinary care can get the same service from it that an expert can.

A power of wide adaptability—the contractor's own.

You will want just that kind of an engine if you are
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—Doing bridge work
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You don't need to consider for a moment whether an I. H. C. Engine is adapted to your needs. That is beyond all question.

It is made in horizontal style—Portable and Stationary—4, 6, 8, 10, 12 and 15 horse power. Vertical in 2, 3, 4 and 5 horse power.

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Technical Information

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For information address, Box K, care Cement and Engineering News, 226 La Salle St., Chicago, Ill.

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

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The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.
Write for Catalogue D. Washington, D. C.

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STANDARD TESTING SAND AND
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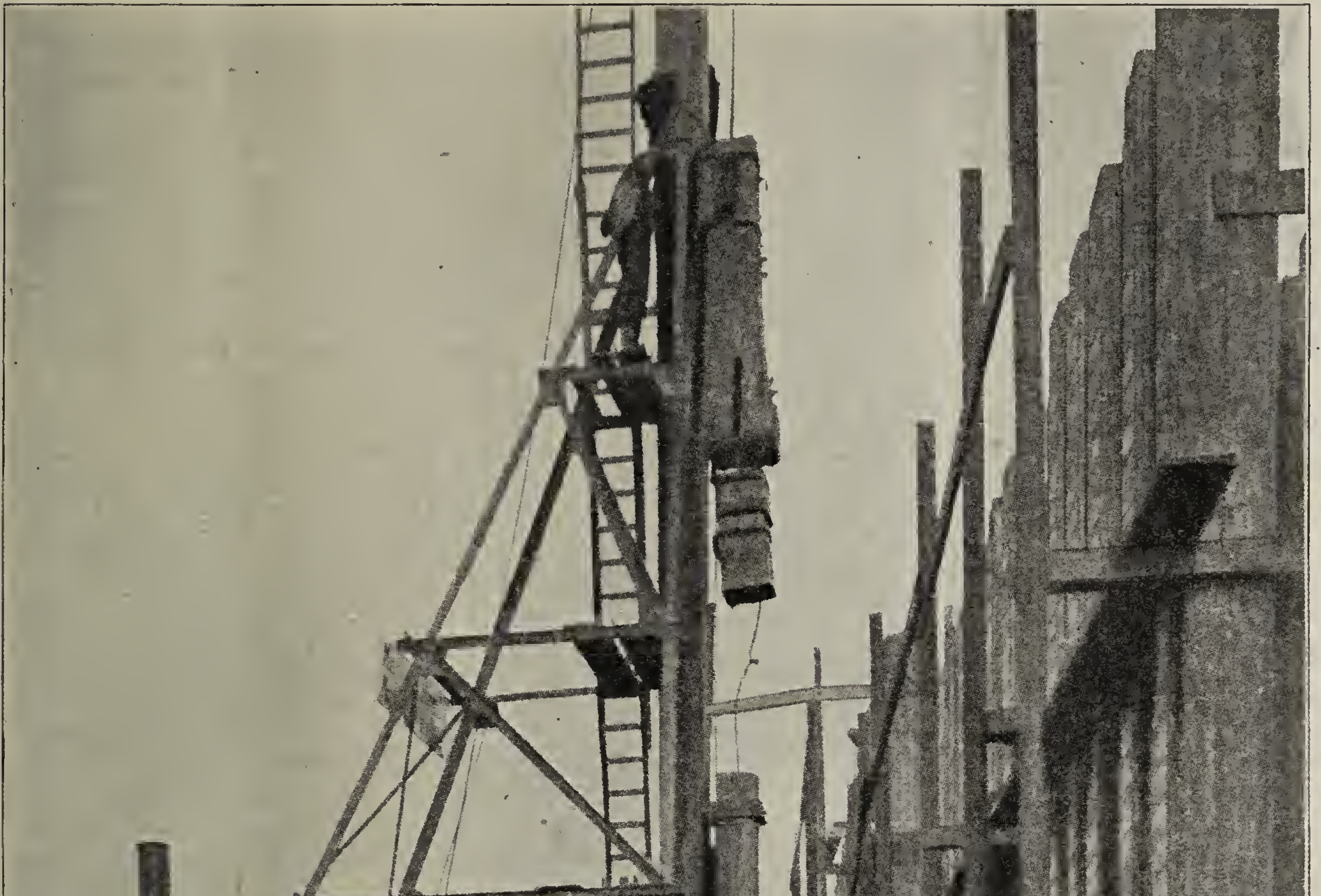

DRIVING REINFORCED CONCRETE PILES.

Concrete piles are now displacing wooden piles to some extent, especially for docks fronting on salt water where the teredo or ship worm destroys wooden pilling. The concrete pile, being heavy, cannot be handled as quickly as the wooden piles. It takes about fifteen minutes to raise a concrete pile from the ground and place in position for driving. To drive a 20 to 26 foot pile requires from 200 to 300 blows, delivered at the rate of seven strokes per minute. When piles are assembled and placed in perpendicular rows, they can be handled in about the same time as wooden ones.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
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Cable Address—"Seafert," Chicago.

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This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, JUNE, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE CEMENT MARKET.

The demand for cement at present is far in excess of production, the mills are now grinding on orders booked. This is an unusual condition in the American cement industry. The result is that consumers are clamoring for cement, and are willing to pay high prices for quick deliveries, with the result of a constantly upward tendency of prices. This is all in favor of the manufacturer and against the consumers, who were late in placing mill orders for the season's supply. Contractors who stocked up during the first three months of the year now have the advantage of from 40 to 70 cents per barrel over competitors buying at present prices.

Many lines of concrete work at present prices of cement cannot compete with brick and stone masonry.

While sales of Hollow Concrete Block machinery in many parts of the country have fallen off fully one-half, the manufacturers in this line are calling in their salesmen. This is unfortunate, and demonstrates the fact that the hollow concrete block industry can only thrive on cheap cement.

Reports from abroad show that European cement mills are full of American orders. Thus our doors are again being thrown open for the reception of vast quantities of foreign cements, particularly so on the Pacific coast, simply because our own mills cannot supply the home demand. Consequently new cement mills are springing up all over the country at an alarming rate. Yet there seems to be room for them all.

The American cement industry has grown up through a mass of prejudice, the last vestige of which was overthrown and buried by the splendid showing made by concrete in the San Francisco earthquake and fire. Even that certain class of architects who cling to the ideas and material of construction of their ancestors with Chinese tenacity, have either fallen into line or have been stricken dumb by the splendid mass of constantly accumulating testimony favoring concrete as an ideal material of construction.

Julius Caesar and the men of his age knew more about concrete and its use than many men of our own day.

CITY ORDINANCES AND CONCRETE CONSTRUCTION.

Since the San Francisco earthquake and fire new light seems to have struck the various city councils of the country on the subject of concrete construction. City ordinances are being revised to permit the use of concrete on equal terms with other materials of construction. Yet in almost every instance these ordinances are being hampered with unfair restrictions which are more or less burdensome. For instance, at Cleveland, Ohio, the ordinance calls for a rigid inspection of all concrete buildings under way, the cost of such inspection to be paid by the owners, while the city pays for the inspection of all other class of buildings. Again, in other cities 12-inch solid reinforced concrete outer walls are called for, where a thin hollow terra cotta block, with less than two inches of material, will pass as satisfactory. These restrictions are pure and simple the result of political pull exerted by well organized brick trusts and bricklayers' unions.

In the city of Chicago the bricklayers' unions will not work on buildings where concrete building blocks are used unless the walls in which concrete blocks are used are backed up with at least an equal thickness of brick; to overcome this state of affairs, Chicago architects are substituting 4-inch concrete veneer block, backed up with eight inches of brick. This satisfies the bricklayer, yet they continue to show their teeth at every opportunity. The bricklayer foreman threatened to pull the job because forms were erected in the wall and the cast made in the wall because it could not be raised from the ground in a single piece. The bricklayers insisted that this identical piece be molded on the ground in sections small enough to be handled by their men.

CEMENT PRODUCTION IN 1905.

According to the latest bulletin issued by the United States geological survey the production of Portland cement in 1905 amounted to 35,246,812 barrels, valued at $33,243,867, which represents a gain of 8,740,931 barrels in quantity and $9,890,748 in value over 1904.

BRICK VS. CEMENT.

R. Clipstone Sturgis, the scholarly chairman of the Boston School House Commission, and champion of brick sidewalks for school buildings, has thrown down the gauge of battle to the cement sidewalk interests.

Chairman Sturgis moves in an atmosphere of purified and aromatic art. He says frankly that part of his mission as schoolhouse commissioner is to teach the people of Dorchester and other sections of Boston some of the things they do not believe in at present, namely brick sidewalks.

The battle royal is to be threshed out over the question of the kind of sidewalk to be laid around three sides of the new William E. Endicott school house. The people are a unit in favor of cement, and demand a hearing on the subject. The chairman, Sturgis, has conceded a public hearing to his opponents. The city is being canvassed for recruits. Men with petitions, men with arguments, men with adjectives for present and future use, agitated the atmosphere as they hurried from house to clubroom, from flat to villa, and urged every able-bodied man to be on hand and tell the chairman of the schoolhouse commission a few things in favor of cement.

Chairman Sturgis says the Endicott school will be a monstrosity and a reflection upon human ken if a cement sidewalk is built. He insists that he is right, and usually he has the last word, but a hearing has been ordered, probably for the purpose of clearing the minds of those who shout for cement.

Forty Orators Will Speak.

Chairman Sturgis may have reason to regret that he went so far as to concede a hearing. The Harvard Improvement Association will send a corps of forty tried and true orators, favoring cement, headed by Col. Thomas F. Doherty, who are expected to knock the chairman's arguments galley-west.

It may be necessary to adjourn the hearing to Faneuil Hall, owing to the crowd that is expected to be present.

The Janesville Cement Post Co. has substituted a reinforcement of wood for steel heretofore used in its product. Four carloads of posts have been shipped to the Chicago & Alton Ry.; 30 carloads have been shipped in a single week. Farmers are beginning to use cement posts on an extensive scale, finding them satisfactory after several years' trial.

The wooden reinforcement for these posts come cheaper and give equally as good service as the steel heretofore used.

A CORRECTION — CEMENT PLANT PROMOTERS.

In our May issue we referred to an article published in the Evening Star of Independence, Kas. This article arraigns in severe terms the methods and system employed by the promoters of the Western States Portland Cement plant and drew an unfavorable comparison beween the first cost and output of the Western States Portland Cement Company's plant and a new cement plant in the same vicinity, all of which the editor of the Star has retracted in a letter shown to us over his own signature, stating the article was unjust and not founded on fact. Our own article on promoters seems to have touched the F. W. Cowham syndicate to the quick. Several representatives of the said syndicate called on us armed with a mass of evidence in the form of affidavits and letters from bankers, manufacturers, and many stockholders in one or more of the cement plants built and operated by the Cowham syndicate. The essence and purport of said letters, affidavits, documents, and exhibits expressed absolute confidence in said F. W. Cowham and associates and that the cement mills erected by him were modern and up to date and that handsome dividends were being declared by said mills now under his control; that the returns from stock invested have been satisfactory to owners thereof. All of which we cannot gainsay. We concede that the Cowham syndicate has erected good, substantial mills, equipped with high grade machinery, yielding satisfactory output.

LA FARGE CEMENT.

This is a white cement but not a true Portland cement. It is used in laying up brick and stone fronts for first-class buildings on account of its light color and non-staining properties. Is made at Viniers, Ardeche, and Marseille, France, by the Society J. & A. Pabin La Farge. The output is 100,000 tons annually. It carries the following composition:

	Per cent.
Silica	29.20
Alumina	2.35
Iron	1.90
Lime	59.00
Magnesia	1.60
Sulphuric Acid	.75
Undetermined	5.20
	100.00

The La Farge cement is extensively used in the United States. The Art Portland Cement Co. of Kimmell, Ind., expects to place a white Portland cement on the market in August which will undoubtedly largely displace the La Farge cement in the near future.

WATERPROOFING CEMENT BLOCKS.

In our May issue we published a test on the water absorption of concrete blocks made of limestone screenings with and without the admixture of Medusa Waterproof Compound, the untreated block showing 7.12 per cent absorption of water in 24 hours, while the addition of 1 per cent of Medusa Waterproof Compound reduced the absorption to 1.65 per cent and 2 per cent to 1.27 per cent after standing two inches deep in water for 24 hours.

A new test in which sand and gravel was substituted for the limestone screenings, in blocks of substantially the same mixture, the untreated sand and gravel block, set 2 inches in water after 24 hours, showed an absorption of 5.16 per cent, while 1 per cent of waterproof compound in the mix reduced the absorption to .70 or slightly over two-thirds of one per cent, while 2 per cent of the compound reduced the absorption to .30, or less than one-third of one per cent in 24 hours. This is an extremely satisfactory showing for the Madusa Waterproof Compound, and is likewise a demonstration in favor of sand and gravel against limestone screenings.

Concrete blocks treated with this compound can safely be plastered directly on the inner face of the blocks without the use of furring.

The Medusa waterproofing is manufactured by the Sandusky Portland Cement Co., Sandusky, Ohio.

Frank R. Blizzard, formerly with the Alpha Portland Cement Co., and for the past three years superintendent of the Buckhorn Portland Cement Co., has resigned his position to return to the Alpha company, where he will take charge of plants No. 1 and No. 2.

A Portland cement plant with American type of rotary kilns has been erected on concrete piles at Venice, Italy.

MARL IN OHIO.

An area of marl has been recently reported at Catawaba Station in Champaign county, Ohio. The deposit is said to occupy the valley of Buck creek between Catawaba Station and New Marfield, Clark county. The valley at this point is about one mile wide, flanked by gravel and limestone ridges. It is not known that the marl covers the entire width of the valley, but it has been observed to out-crop at various places between these points indicated.

Samples from the land of Mr. George P. Roop, recently examined, show that the marl is pure and would probably be a valuable asset for Portland cement manufacturing. No one has yet made a careful examination of the vicinity and the depth of the marl cannot be stated. It lies close to the surface, in many places being covered by not more than one foot of black soil. The main line of the Big Four railroad passes through the property. Persons interested can obtain details by visiting the locality, or corresponding with Mr. Ropp, whose postoffice address is Mechanicsburgh, Ohio, R. F. D. No. 5.

A new Portland cement company has been organized at Fortine, Mont., near the line of the Great Northern railway. One thousand six hundred acres of land have been purchased surrounding Fortine lake, which contains marl. A sawmill will be erected in connection with the cement plant; $350,000 will be expended in the joint enterprise. M. L. Bevis of Seattle, whose office is in the Empire building, is president ; H. M. Thatcher, vice-president. The land was purchased from John Dahlberg of Fortine.

The Atlantic Portland Cement Company, in which several Philadelphia capitalists are reported to be interested, has awarded the contract for the erection of a $1,000,000 plant at Stockertown, near Easton, Pa.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	APRIL				TEN MONTHS ENDING APRIL			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom	....	....	36,600	$ 109	6,997,424	$ 22.910	15,209,980	$ 46,930
Belgium	9,645,714	$ 32.445	6,216,117	21,809	139,602,052	454,863	110,154,112	348,140
France	752,300	2,500	297,600	1,019	6.263,599	24,283	5.919,697	21,723
Germany	8,294,768	26,510	10,531,708	35.715	177,067,598	599,281	157,945.619	528,514
All Other Europe	....	....	....	....	1,227,501	4,224	396	1
British North Am.	....	....	11,900	64	152.915	1,049	51,550	311
Other Countries	....	....	2,209,000	8,520	1,871,264	7,166	2.263,155	9,021
TOTAL	18,692,782	$61.525	19,299,925	67,272	333,182,353	$1,113.776	291.544,488	$956,640
Domestic Exports of Cement, bbls.	120,082	$141,999	48.954	$69,657	843.758	$1,189,260	700,804	$996,404

There were 8,659,149 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in April 1905, valued at $29,083, against 5.658,142 lbs. in April 1906, valued at $17,097.

For 10 months ending in April 1905, there were 98,605 tons of asphalten imported in the United States. valued at $447,291 against 58,845, tons imported in 10 months ending April 1906, valued at $263,519.

REINFORCED CONCRETE FAVORED AT SAN FRANCISCO.

Engineers, architects and especially owners of buildings destroyed are anxious to adopt reinforced concrete construction in the rebuilding of San Francisco, and desire all legal restrictions removed under the old city ordinances against this class of construction, as will be seen by the expression of opinions by parties interested.

"If they are going to place restrictions on reinforced concrete construction merely to serve the ends of parties interested in brickwork then we better throw up our hands. Then good-by to the new and greater San Francisco."

Henry P. Sonntag, who lost six buildings in the fire, made this significant statement on the attempt that is being made to amend the new building ordinance now before the Board of Supervisors, in order to defeat by indirect measures the possibility of building with reinforced concrete.

"It is a stand-up play," he continued. "At this time there should be no obstacle placed in the way of men who are ready and eager to rebuild the city. I am rebuilding three of my buildings, and will use reinforced concrete, but if that material is prohibited by oppressive legislation there will be no building. Property owners want no unjust and ridiculous restrictions now. What is good law in the East for construction should be adopted here, and the city authorities should do all in their power to help us. We need the new ordinance on the same lines as those of New York or Chicago, and another thing, we want it adopted right away, so that we may know right off where we are at without further delay."

As the building ordinance was originally drafted and submitted by Engineer Galloway and others, it gives reinforced concrete the same opportunity as the Eastern ordinances give. But there has been introduced the following amendment, which is regarded by architects, engineers and builders as inimical to that type of building:

"Reinforced concrete walls shall be at least six inches thick. If the area of wall surface included between any two adjacent wall columns and adjacent floor girders exceeds 300 square feet and is less than 400 square feet the thickness of wall shall not be less than eight inches. If such area exceeds 400 square feet the wall thickness shall not be less than twelve inches."

The proposed amendment was shown to M. C. Couchot, the civil engineer who prepared the sections on reinforced concrete.

"That was not in the ordinance," he said; "it should never be incorporated in it. There is absolutely no need for such restrictions. The man who wrote that did not know a thing about which he was writing, for the reason that we never build such structures as would have these wall dimensions in reinforced concrete. As an engineer who has built several reinforced concrete buildings, some of them in the earthquake zone, I can state that a six-inch wall of reinforced concrete is a good deal stronger than a brick wall of thirteen inches in thickness.

"You could not shake off six-inch walls of reinforced concrete when they are fastened to the frame of the building. There is positively no necessity for the thick walls which somebody would have embodied in the ordinance. Reinforced concrete buildings cost much less than steel frame buildings and they are more rigid and better able to resist earthquake and fire. I have erected in the past year reinforced concrete buildings at Marysville, on West Mission street in this city, a power station in Visitation Valley, near the San Mateo county line, and a machine shop at Nineteenth and Harrison streets, the last one being a two-story brick on reinforced concrete foundations, and it stood while all the buildings about it went down.

"I tried for two years to have the building ordinance amended to permit the erection of reinforced concrete buildings in San Francisco, but failed, and at last had to compromise on brick walls for concrete interiors."

Frank B. Gilbreth, the New York civil engineer, who is head of the Gilbreth construction organization, said:

"The discussion now before the Supervisors of San Francisco makes it necessary for every architect, engineer and contractor to contribute an opinion based upon experience regarding the subject of reinforced concrete as a building material to use in the new San Francisco.

"The lessons of the Baltimore conflagration, the Sioux City fire, the Toronto holocaust, and the far greater ruin of San Francisco, prove conclusively that concrete, and especially reinforced concrete, is the best material from every point of view to use as a building material in large cities where the danger of conflagration is great.

"At the present time reinforced concrete, under the critical test of the engineer, is opening an era in construction as distinct as the graduation from wood to steel, and there is accordingly a large and increasing demand for concrete work of the best type. Reinforced concrete is non-inflammable, and there is no temptation to paint or varnish it. Because of this it surpasses heavy mill construction. It will not warp or twist when hot, and in this it surpassed unconcreted steel.

"The coefficient of expansion (by heat) is the same for its two constituents, concrete and steel, and again in this it surpasses tile and steel construction. It requires hotter fire to raise it to a dangerous temperature than any one fireproofing substance, because of the heat required to drive off the large amount of chemically combined water which it contains; and it follows conclusively that in this it once more surpasses all rivals as a form of construction.

"It is a poorer conductor of heat than ever after the water has been driven off. Hence the rate of heat penetration actually diminishes as the heat continues. Here again it excels its rivals. It requires only plastering to repair such superficial damage as the worst caused by the Baltimore, Toronto, Sioux City and San Francisco fires. It costs little or no more than the least expensive of its rival, heavy timber mill construction. It shows a handsome saving in first cost over all other kinds of construction. The first cost of a concrete building is the whole cost, because the repair and maintenance expense is negligible. In this it surpasses all rivals. Structures of other materials reach their maximum strength the day they leave the builder's hands. Concrete continues to grow stronger for years after.

"Some other and better known merits of reinforced concrete are that it uses only materials easily transported and obtainable anywhere. It offers unsurpassed possibilities for rapid and substantial construction. It requires neither painting nor pointing, and such steel as is used is out of the reach of corrosion and rust. It can readily be combined with brick work or structural steel work to meet special conditions. It is more durable and more easily kept in perfect condition than steel construction, and the contractor and the owner are independent of the output of the steel trust, for the reason that the steel that is used is in small sizes that may be easily obtained from the small mills.

"The many exhibits that can be seen on every hand in San Francisco, Palo Alto, San Jose and Los Angeles, prove conclusively that an earthquake such as the one of April 18 would do little or no damage to structures of reinforced concrete. Therefore, this type of construction is absolutely necessary wherever a permanent, incombustible and quickly constructed type of structure of moderate cost is required.

"There seems to be an impression in certain quarters that the recent conflagration in San Francisco was the first real test of reinforced concrete in this country. On the contrary, one has but to read the report on the Baltimore fire by our consulting engineer, Charles L. Norton, professor of heat measurements at the Massachusetts

Institute of Technology, rendered to the Hon. Edward Atkinson, director of the Insurance Engineering Experiment Station at Boston, to learn that reinforced concrete has stood the test of fire.

"Mr. J. P. Gray, C. E., a well-known engineer, states: 'I specially approve of that part of the report of Professor Norton related to the advantage of concrete construction, basing my opinion on observations made not only at this fire, but at previous ones which have occurred in buildings of concrete and other types of so-called fireproof construction.'

"There seems to be an opposition in some quarters to reinforced concrete buildings as a result of a fear that concrete is going to interfere with the construction of other types of buildings. But this has been proven to be quite to the contrary in various parts of the United States.

"To give an idea of the prominence with which all types of cement and concrete construction are on the increase in the United States, I call attention to the fact that in 1882 100,000 barrels of Portland cement were used in the United States, while in 1905 the consumption was over 35,000.000 barrels. Personally, my organization has constructed every type of building, and from my experience and careful study with our consulting engineers, Lewis J. Johnson, professor of civil engineering at Harvard University, and Charles L. Norton, professor of heat measurements at the Massachusetts Institute of Technology at Boston; also Ernest Goodrich, C. E., chief engineer of the design and construction of the $5,000,000 worth of concrete buildings for the Bush Terminal Company, and J. W. Mair, I am prepared to demonstrate to any one that the reinforced concrete buildings are the most suitable to build in San Francisco, and that capitalists need have no hesitation in investing their money in property in San Francisco if its buildings are of reinforced concrete, for the reason that such buildings would receive no damage from any sort of conflagration and practically no injury from a repetition of the earthquake of April 18, 1906."

A MEXICAN SLAG CEMENT PLANT.

A Portland cement mill is under way at Monterey, Mexico, to manufacture cement from slag. Henry S. Spackman Engineering Co. made the plans and are engineers of erection. The plant will be modern and up to date. It is expected to be in operation in July, turning out 200 barrels per day at the start. The capacity will be increased to 500 barrels per day before the close of the year.

Michigan is now producing 17,000 barrels of Portland cement per day.

NOTES FROM THE PHILIPPINE ISLANDS.

The United States government has installed a complete cement testing laboratory at Manila, P. I., including all the apparatus necessary for the complete tests of cements and mortar. The following brands of cement have been tested during the year 1905: Germanic, Hercules, Onoda (Japan), Atlas, Green Island (China) and Josson.

The Philippine Commission employs eight American engineers, four native engineers, and one Chinaman. At Manila, first assistant city engineer, salary $5,000; two second assistant city engineers, salary $3,600 each; three assistant engineers, salary $3,200 each; one engineering draughtsman, $2,800; architectural draughtsman, $2,800; one transit man, $3,200; native draughtsman, $840; one draughtsman, $600; one Chinaman draughtsman, $600.

The center pier of the Hoyonoy wooden drawbridge was completed in June, 1904. It was built of concrete on pile foundations. The rock for turning gear and turn-table being in place in July a heavy storm washed out a greater portion of the earth under the base of the pier. In August the pier began to settle on the upstream side. Work on the bridge was suspended. In January, 1905, the pier failed, turning over down stream, and depositing 90 tons of concrete into the river. On examination the piles were found to have been completely eaten up by the teredo.

The Iloilo-Capiz Batan Railway, now under construction, has adopted reinforced concrete construction for all bridges and culverts now over 18 feet span. Yet up to 25 feet spans in reinforced concrete have been erected. Concrete mixtures used in these structures are 1 cement, 3 sand and 6 gravel, which cost $8 per cubic yard in place, and steel reinforcing 5 cents per pound in place, while stone masonry cost $10 per cubic yard in place. Flat top reinforced concrete culverts designed for uniform loads of 2,000 pounds per square foot with a factor of safety of 4 at 45 days. Footings 3 feet deep. Bearing power of soil estimated at 2,000 pounds per square foot. Piers and abutments are 5x20 feet at top, batter 1 to 12, footings 5 feet deep, bearing power of soil 1 ton per square foot.

The Iola Portland Cement Co. has increased its capacity to nearly 6,000 barrels per day. Five new rotary machines have been installed, four of which are in operation. When the fifth new rotary comes into use the output will be over 6,000 barrels per day.

NEAT PORTLAND CEMENT.

Portland cement mortar without sand will not prove sound in actual work after hardening. It will continue sound only while it is kept in a sealed chamber at a practically even temperature. As soon as the mass is exposed to elements it will contract in volume, show cracks and hair lines, especially when alternately exposed to rain, sunshine and wind. It will alternately swell and contract the oftener the change from wet to dry. Still more does it show unsoundness by increasing the size of cracks and hair lines. Alternate freezing and thawing of moist or wet neat cement masses is liable to shatter it into fragments in the course of time. Neat Portland cement is therefore an untrustworthy building material. The same is true of all other hydraulic cements, and to a much greater extent than in Portland cement. Portland cement can only be used in actual constructions mixed with aggregates, one of cement to one of sand will weather well. Yet leaner mixtures will show less expansion and contraction.

CEMENT IN GERMANY.

U. S. Consul Trackara of Berlin, Germany, reports 320 cement mills in Germany, 117 of which make Portland cement. The output by the Cement Syndicate mills in 1904 was 27,950,000 barrels. The output of independent mills not obtainable. Cement is sold in Berlin at a profit of 11.9 cents per barrel, the price being $1.31 per barrel of 375 pounds. Cement has sold as low as $1.14 to $1.19 per barrel, delivered at the building, including the barrel. Cement bags are valued at 4.76 cents each. During the past years various attempts were made to consolidate the different cement syndicates under one head. Last October a loose arrangement was effected to divide and apportion the country into districts to which the South German and Rheinish-Westphalian and Lower Elbe syndicates at last subscribed. The whole of Germany is now covered with a network of agreements, which have resulted in maintenance of better prices.

These agreements between the mill owners excluded middle men, covering 700 firms, whose combined sales were 6.500,000 barrels per year. In November the middle men formed a buying syndicate, and demanded from the cement manufacturers an extra rebate of from 6 to 10 per cent for its members. The syndicate factories refused to comply with the request of the dealers' union, so new conflicts appear to threaten the German cement industry. The union dealers are discussing the advisability of erecting their own cement factories, but up to the present no actual steps have been taken.

SAN FRANCISCO CITIZENS WANT REINFORCED CONCRETE.

The use of reinforced concrete in the buildings that are to make the new San Francisco, was discussed by the Citizens' Committee of Forty.

Marsden Manson started the ball by announcing to the committee that he had been surprised to learn that selfish interests were attempting to prevent the use of a material which among other architects and engineers was regarded as nearly ideal. He believed that this opposition centered among the bricklayers who feared that their trade would be injured by its adoption. Whether this was so or not, it was unquestioned that reinforced concrete was the best and most serviceable material that had been devised. He moved that the Committee of Forty recommend that the Board of Supervisors do not interfere with the use of this material as outlined in the report of the Committee on Building Laws.

"I have been as much surprised as Mr. Manson," said Mr. Phelan, "to discover this opposition to the use of reinforced concrete. Engineers as well as others confirm the belief of reinforced concrete. Engineers and others confirm the belief that it is an ideal material. Personally, I am not in favor of brick construction. Bricks are very unpleasant things to have falling about your ears. I have three buildings of recent construction in San Jose in ruins, and the laws of San Jose favoring, I propose to construct them of reinforced concrete. I do not believe that the selfish interest of any class should be permitted to stand in the way of the use of this material in San Francisco. I have been told that the opposition that has sprung up in the Board of Supervisors is traceable to bricklayers."

"And you might add," said the Mayor, "the brickmakers."

"However that may be," continued Mr. Phelan, "I move that a committee of three be appointed to wait upon the Supervisors at their meeting this afternoon, and urge that nothing be done that will prevent the profitable use of reinforced concrete."

Mr. Phelan's motion was accepted by Mr. Manson, and the Mayor appointed on the committee Mr. Phelan, Mr. Manson and R. B. Hale.

Dan Yancey, late assistant county attorney at Silver Bow county, Mont., now a resident of Livingston Park, E. Mont., states that a cement plant is under construction on the Holladay ranch, five miles from Livingston, 300 men being employed. Another plant is projected at Limespur, Jefferson county, Mont., 42 miles east of Butte, on the N. Pacific Ry.

LABOR TROUBLE OVER CEMENT WORK.

School houses under construction at Newark, N. J., are being delayed on account of a dispute between the bricklayers' union and the cement workers' union. The bricklayers' union want both the mason and cement work, which the cement workers refuse to concede. School Commissioner Vailey says the unions are either fighting among themselves or with their employers, resulting in frequent strikes that tie up school work. Now comes the plasterers' union and claims the exclusive right to do all the cement work on the Newark school buildings.

Next the bricklayers' and plasterers' unions notified the city council that unless they are given the cement work on the new school buildings, now under way, they will not permit their members to work on such buildings; that in the future the masonry work must not be given to more than one contractor on all public works, as the constitution and by-laws of their unions require the same. The other trade unions of Newark are opposed to the stand taken by the bricklayers, with a protest as follows:

"We, the undersigned members of the Board of Business Agents of the various bodies affiliated with the Building Trades Council, protest against the reported action of the brick masons in demanding that the master mason be the general contractor on all public works."

In the meantime the city suffers from the lack of school accommodation.

The El Paso Portland Cement Co. has been organized at El Paso, Tex., under the laws of Texas. Capital, $500,000; $50,000 paid in. The incorporators are A. Courchesne, Felix Murtinez, J. L. Marr, H. B. Stevens, Silberberg Bros., J. W. Malcomson, E. R. Carpenter, Felix Brunschwig, Z. T. White and L. Lindsay, all of El Paso, Tex.

A Portland cement project is now under way at El Paso, Mexico, just across the river from El Paso, Tex. The leading promoter called on the Cement and Engineering News a few days ago, stating that the Mexican proposition would have 60c per barrel in its favor for Mexican consumption, as this is the duty on cement entering Mexico, against 32 cents per barrel for cement entering the U. S. from Mexico.

The property of the White Portland Cement Co. at Four Mile Lake, Washtenaw county, Mich., was sold to Walter Hogan, representing Douglass, Bowen & Whiting, attorneys-at-law of Detroit, Mich. This property was claimed by Mrs. May Millen, wife of one of the promoters of the cement company. It was bid in at $7,044.27. The money will be paid on a mechanics' lien filed by a company furnishing supplies.

CONCRETE WORK AT CHICAGO STOCK YARDS.

Chicago packers consumed large quantities of cement at the stock yards during the past five years. Reinforced concrete construction has superseded wood in New York, as well as in repairs, especially for floors, columns and beams. Not less than $200,000 has been expended yearly in this class of work. As a rule the companies employ their own engineers and concrete gangs, who are never idle. The companies' engineers and architects prepare their own plans and specifications and do their own work by day labor. Not less than $1,000,000 has been expended in reinforced concrete construction to date. With the view of improving the sanitary conditions and reducing the fire hazard, all of which is attained by the use of concrete.

The Colonial Trust Co. of New York has issued an execution for $1,352,083.33 against the Nazareth Cement Co., and Sheriff Roberts has seized the plant of the defendant corporation.

George F. Coffin, trustee for H. G. Ruinkle, has issued an execution against the same company for $2,048, and the sheriff has levied on the personal property of the cement company.

Trenton, N. J.—The Allentown Portland Cement Co. of Camden, N. J., has been incorporated under the laws of this state with a capital of $2,000,000.

BOOK NOTICES.

Iowa Geological Survey, Bulletin No. 3, supplementary report on Portland cement materials in Iowa, 32 pages with map and diagram, by Prof. S. W. Beyer. Published for Iowa Geological Survey.

Fireproof Hotel Construction, by Albert Moyer, Assoc. Am. Soc. C. E., published for complimentary distribution by the Vulcanite Portland Cement Co., Flatiron Bldg., New York. Describes and illustrates the construction of the reinforced concrete Marlborough-Blenheim Hotel, at Atlantic City, N. J. 12 illustrations.

Tests of reinforced concrete beams. Series of 1905, by Arthur N. Talbot, being bulletin No. 4 of the University of Illinois. Engineering experiments. 84 pages, with numerous diagrams and tables. Published by the University of Illinois, Urbana, Ill.

CEMENT FOR THE FARM.

Seventy-five per cent of the farms of America are a disgrace to their owners, from the standpoint of neatness and appearance of the buildings and surroundings. Wooden structures in varying stages of collapse, rotting fence posts, inefficient watering troughs, and floods of barns and cellars all speak of decay and temporary use. If these farmers could be awakened to the importance of building for all time instead of for a day, says an exchange, the sum total of prosperity in country life would be immeasureably increased.

If farmers would but commence the use of cement construtcion, durable and satisfactory work that will not rot and fall into decay will result. Timber is becoming scarce, stone and brick are dear and need skilled labor whenever they are used. Not so with cement. This, combined with sand and gravel, makes strong and waterproof work as well as fireproof.

It can be used for gutters in stables, cellar and stable floors, drain tile, silos, sidewalks, fence posts, bridges, houses, barns, watering and feed troughs, ice houses and cisterns. There seems no limit to its usefulness. The simpleness with which it is handled commends it to those unskilled in carpentry and other trades. Any farmer can use cement with a little practice. —The Ideal Farmer.

The London Iron and Coal Trades Review has issued the following statement showing the quantity of coal annually produced per worker, based on official reports issued by the various countries:

	1904. Tons.	1900. Tons.	1890. Tons.
United States	563	537	443
United Kingdom..	279	296	297
Germany	248	264	268
France	209	206	216
Belgium	170	177	174
Sweden	151	137	119
Spain	141	131	125
Austria	178	163	183
Japan	117	106	123
British India	89	69	66
Australia	414	454	295
New Zealand	468	445	345
Natal	175	76	140
Cape of Good Hope	80	51	76

CEMENT WORKERS LOCKOUT CARPENTERS' UNION.

The Master League of Cement Workers of New York city has declared a lockout against about 700 carpenters which it employs to build wooden forms in which concrete floors are constructed. This lockout will affect the cement workers in as much as no cement work can be carried on without forms. The trouble arose over a strike of the Brooklyn branch of the Brotherhood of Carpenters in violation of an agreement with the Employers' Association of Greater New York, of which the cement workers are members. The refusal of the New York branch of the Brotherhood of Carpenters to call off the strike of its Brooklyn members as provided by the agreement caused the lockout.

WATER TIGHT SUBMERGED CONCRETE TANKS OR WELLS.

The subject of constructing water tight elevator wells was discussed by several correspondents in the Tonindustrie Zeitung of recent date, from which we abstract the following:

The original correspondent having constructed a concrete elevator well which did not prove water tight asked for light on the subject. The first answer by Herr Fischer states that he had similar trouble in a partially submerged elevator well where the ground water at times rose 31½ inches, forcing the water into the well to an even height, the floor having been raised by the outside water pressure. To remedy the fault, a hole was dug twenty inches below the level of the bottom of the well to provide drainage to keep the water below the tank bottom. This hole was constantly emptied. The old floor was taken up and a pavement of cobblestone laid in its place. To prevent the floor from heaving by the outside water pressure, a layer of concrete 3½ inches thick, mixed 1 cement to 4 of sand and gravel, was deposited on the floor. A finishing coat of 1 to 1 Portland cement mortar was laid onto the inner surface of walls and floor and permitted to harden; the surface water being kept down below the floor level by baling the twenty-inch hole every ten minutes. This was kept up for sixty hours to permit the cement to set and harden; the seapage 3-32 of an inch in 24 hours.

We believe the work would have been improved by flooding the tank with water to the height of the ground after 24 hours, no further baling being required, as the outside and inside pressure would have been equalized.

The second answer states that while it is not impossible to make concrete water tight, it is a very difficult undertaking, and recommends outer walls of concerte 8 inches thick upon which is laid a layer of asphalt, 3 to 4 inches thick, the asphalt again to be covered with from 4 to 6 inches thick; all as shown by our illustrations. The tank or well must in every instance be heavier than the cubic contents of an equal quantity of water, otherwise the tank or well will be lifted bodily out of its housing of earth and float like a boat. Where asphalt cannot readily be obtained a thin sheet-iron tank may be substituted for the asphalt. This is likewise to be covered inside and out with concrete.

ARRANGING TO SELL READING CEMENT CO.

John M. Frame, trustee in the bankruptcy proceedings of the Reading Cement Company, at Molltown, presented a petition to Referee in Bankruptcy Samuel E. Bertolet, for an order for the sale of the plant, machinery and real estate at public sale. Mr. Frame disposed of about 13,000 barrels of cement, which was on hand when the property was turned over to him, and realized $7,800.

Several attempts were made to effect a reorganization, but all failed, because a considerable amount of money would be required to be put in. June 18 was fixed by Mr. Bertolet for a hearing on the application.

Railway lines west of Chicago are charged with making rebates on building materials destined for San Francisco, originating east of Chicago. The agents of western roads have been canvassing manufacturers of steel, cement and other building materials for tonnage which is billed at regular rates, with a cut west of Chicago.

Philadelphia Concrete Co. of New York; building houses, docks, bridges, etc.; capital, $150,000. Incorporators: Frederick A. Sherwood, Philadelphia; Clinton Burling, No. 198 Broadway; R. W. Sprague, Jr., No. 32 Liberty street, both of New York.

The large $800,000 cement plant, recently completed at New Castle, Pa., has been started. About 1,200 barrels of cement are being made daily, but this will be increased to 1,600 when the plant is in full running order.

Pittsburg capitalists have secured a charter in West Virginia for the Federal Portland Cement Co. Works will be erected ten miles from Morgantown, Monongalia county, W. Va.

The Federal Portland Cement Co. has been incorporated.

The Iola Portland Cement Co. has secured about 1,000 acres of gas land leases in addition to former holdings.

T. G. Dickinson, general manager and vice president of the Marquette Cement Co., has returned from a two months' tour of European countries.

The Hecla Cement Co. expects to start up July 1st; the plant has been remodeled to use limestone instead of marl.

The Constitution of Hydraulic Cements

BY DR. W. MICHAELIS, SEN.

Paper read at the XXIX Annual meeting of the Association of German Portland Cement Manufacturers at Berlin, Germany, on February 17, 1906.

TRANSLATED BY DR. W. MICHAELIS, JR.

By the microscopic researches of Le Chatelier, Toernebohm and Clifford Richardson, much light has been thrown on the composition of the Portland cement clinker, so that its constitution is known to us at least in a general way. Well vitrified clinker obtained from intimately mixed raw materials consists, according to these investigators, mainly of alite and celite; in addition to these, belite and felite and a certain quantity of a glassy residue may be found.

The most widely applicable formula for cements, before vitrification, including the Roman cements, may be given as follows:

$$x\left[\sum_{0}^{3}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\end{matrix}\right]+y\left[\sum_{0}^{3}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\end{matrix}\right]+z\left[\sum_{0}^{1}\mathrm{CaO(MgO)}\begin{matrix}\diagup\, 2\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO(MgO)}\\ \diagdown\, 2\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO(MgO)}\end{matrix}\right]+\text{Rest.}$$

This formula shall indicate that the amount of lime which remains, after deduction of 3 molecules of lime for each 2 molecules of silica or alumina, has not acted upon these acids before vitrification has taken place, that is to say, that it is in an uncombined state, and shall leave it an open question whether or not by clinkering or fusing a tri-calcium silicate is formed or this amount of lime is merely dissolved in the sintered silicate. I regard it as impossible, that a chemical combination $\mathrm{SiO_2},\ 3\ \mathrm{CaO}$ exists, but many investigators are, as you know, convinced of the possibility of existence of a tri-calcium silicate.

If we make of this formula two, wherein the value $\sum_{0}^{3}$ CaO is $\sum_{0}^{1.5}$ in the first place and $\sum_{1.5}^{3}$ in the second place, the formula:

$$\text{A) } x\left[\sum_{0}^{1.5}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\end{matrix}\right]+y\left[\sum_{0}^{1.5}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\end{matrix}\right]+z\left[\sum_{0}^{1}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\end{matrix}\right]+\text{Rest}$$

comprises all Roman cements, and the formula

$$\text{B) } x\left[\sum_{1.5}^{3}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\end{matrix}\right]+y\left[\sum_{1.5}^{3}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\end{matrix}\right]+z\left[\sum_{0}^{1}\mathrm{CaO}\begin{matrix}\diagup\, 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown\, 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\end{matrix}\right]+\text{Rest}$$

all possible Portland cements.

The ratio $\frac{\mathrm{CaO}}{\mathrm{SiO_2}+\mathrm{R_2O_3}}$ in percentages of weight, is for A 1.14 to 1.75, and for B 1.75 to 2.35.

For instance, a Portland cement of the following composition, in which the ratio of the molecular weights of $\mathrm{SiO_2}$, $\mathrm{Al_2O_3}$, $\mathrm{Fe_2O_3}$ is 18:31:1,

$\mathrm{SiO_2}$	= 22.78%
$\mathrm{Al_2O_3}$	= 6.47 "
$\mathrm{Fe_2O_3}$	= 3.37 "
CaO	= 64.38 "
MgO	= 1.68 "
$\mathrm{K_2O}$ $\mathrm{Na_2O}$	= 0.75 "
$\mathrm{CaSO_4}$	= 0.57 "
	100.00%

would require the following formula, before vitrification takes place:

$$18\left[\frac{3\,(3\,\mathrm{CaO}+2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO})}{2\,(\mathrm{CaO}+2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO})}\right]+3\left[\frac{3\,(3\,\mathrm{CaO}+2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO})}{2\,(\mathrm{CaO}+2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO})}\right]+\left[\frac{\mathrm{CaO(MgO)}+2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO(MgO)}}{\mathrm{CaO(MgO)}+2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO(MgO)}}\right]+\text{Rest.}$$

This means, that this cement contains 3 parts of so-called tri-calcium compounds to 2 parts of so-called di-calcium compounds; furthermore, that the magnesia is supposed to be combined with iron oxide and that the iron oxide combines only with 2 molecules of magnesia or lime, because tri-calcium ferrite and tri-magnesium ferrite do not exist, while a solution of lime in di-calcium ferrite has the tendency to blow and therefore must be avoided.

If we assume tri-calcium silicate to exist, the formula given above may be written as follows:

$$18\left[\frac{3\,(\mathrm{SiO_2},\ 3\,\mathrm{CaO})}{2\,(\mathrm{SiO_2},\ 2\,\mathrm{CaO})}\right]+3\left[\frac{3\,(\mathrm{Al_2O_3},\ 3\,\mathrm{CaO})}{2\,(\mathrm{Al_2O_3},\ 2\,\mathrm{CaO})}\right]+\left[\frac{\mathrm{Fe_2O_3},\ 2\,\mathrm{CaO\ (MgO)}}{\mathrm{Fe_2O_3},\ 2\,\mathrm{CaO\ (MgO)}}\right]+\text{Rest.}$$

A cement, in which the highest limit of lime was reached, has been obtained by me by fusion in 1891. Its composition was the following:

$\mathrm{SiO_2}$	= 21.0%
$\mathrm{Al_2O_3}$	= 4.9 "
$\mathrm{Fe_2O_3}$	= 2.7 "
CaO	= 69.0 "
MgO	= 1.0 "
$\mathrm{K_2O}$ $\mathrm{Na_2O}$	= 0.5 "
Rest	= 0.9 "
	100.0%

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The di-calcium compounds answering to the lowest lime limit in the preceding formula do not yield a suitable cement; the ratio $\frac{\mathrm{CaO}}{\mathrm{SiO_2 + R_2O_3}}$ is as low as 1.593, while the standard specifications prescribe that this ratio must be at least 1.7. The commercial Portland cements represent a mixture of approximately equal parts of tri-calcium and di-calcium compounds, with the ratio $\frac{\mathrm{CaO}}{\mathrm{SiO_2 + R_2O_3}} = 2.$

The formula for underburnt Portland cement, therefore, would be:

$$x\left[4\,\mathrm{CaO}\begin{array}{l}\diagup 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\\ \diagdown 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\end{array}\right] + y\left[4\,\mathrm{CaO}\begin{array}{l}\diagup 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\end{array}\right] + z\left[2\,\mathrm{CaO}\begin{array}{l}\diagup 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\\ \diagdown 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\end{array}\right] + \mathrm{Rest}$$

$$\text{or, } x\left[\begin{cases}3\,\mathrm{CaO} + 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\\ \mathrm{CaO} + 2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}\end{cases}\right] + y\left[\begin{cases}3\,\mathrm{CaO} + 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\\ \mathrm{CaO} + 2\,\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\end{cases}\right] + z\left[\begin{cases}\mathrm{CaO} + 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\\ \mathrm{CaO} + 2\,\mathrm{Fe_2O_3},\ 3\,\mathrm{CaO}\end{cases}\right] + \mathrm{Rest.}$$

According to this formula underburnt Portland cement contains in uncombined state that amount of lime which is not contained in the silicate $2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO}$; for the aluminate, however, we cannot say the same with equal certainty, because tri-calcium aluminate is the most easily fluxing lime aluminate; on the other hand, we must admit that vitrification has not yet taken place at the temperature at which underburnt cement is obtained.

Underburnt cement contains uncombined calcium aluminate and calcium ferrite. With beginning vitrification, at from 1450° to 1600° centigrade as the case may be, the following takes place by way of diffusion, as a point of real fusion is not reached: The lime, which so far has remained uncombined, dissolves in the calcium silicate; and the di-calcium aluminate and tri-calcium aluminate, previously formed, likewise dissolve in the calcium silicate, thus forming alite and celite. Alite is the compound highest in lime; it is formed at white heat and crystallizes at first on cooling. Alite, therefore, is an isomorphous mixture of calcium oxide, calcium aluminate and calcium silicate, and is regarded as a rule as a solution of tri-calcium aluminate in tri-calcium silicate, but this is wrong, because a tri-calcium silicate $\mathrm{SiO_2},\ 3\,\mathrm{CaO}$, does not exist.

The amount of alumina contained in the alite depends upon the percentage of lime and alumina in the raw mixture.

Supposing that, if sufficient lime is present, all of the alumina enters the alite, its composition may vary with various Portland cements between 4 and 12 parts of tri-calcium silicate to 1 part of tri-calcium aluminate, namely:

$$\sum_{4}^{12}\left(2\,\mathrm{SiO_2},\ 3\,\mathrm{CaO} + 3\,\mathrm{CaO}\right) + 1\left(\mathrm{Al_2O_3},\ 3\,\mathrm{CaO}\right).$$

The composition of an alite containing 6 silicate to 1 aluminate and that of one with 4 silicate to 1 aluminate follow hereafter:

$\mathrm{SiO_2}$	= 22.00%	= 20.30%
$\mathrm{Al_2O_3}$	= 6.24 "	= 8.64 "
CaO	= 71.76 "	= 71.06 "
	100.00%	100.00%

It is very interesting to see how accurately Toernebohm had estimated the composition of alite, although his calculation was based on a very arbitrary assumption. He gave the following composition:

$\mathrm{SiO_2}$	= 19.48%
$\mathrm{Al_2O_3}$	= 7.83 "
CaO	= 67.60 "
MgO $\mathrm{K_2O}$ $\mathrm{Na_2O}$	= 5.09 "
	100.00%

If we omit magnesia and alkalies, which are contained in the molten mass and do not belong to the alite, and reduce to 100 per cent, we obtain:

$\mathrm{SiO_2}$	= 20.52%
$\mathrm{Al_2O_3}$	= 8.25 "
CaO	= 71.23 "
	100.00%

This is exactly the above mentioned alite with 4 silicate to 1 aluminate.

The same way as the tri-calcium aluminate dissolves in the so-called tri-calcium silicate, the di-calcium aluminate does in the so-called di-calcium silicate.

Tri-calcium ferrite does not exist; but is merely a solution of calcium oxide in di-calcium ferrite.

Clifford Richardson is certainly right in his statement, that the fact that alite is always entirely white is a sufficient proof for the non-existence of a tri-calcium ferrite; on the other hand, this investigator has found that di-calcium ferrite is slightly soluble in di-calcium silicate, but that the bulk of the calcium ferrite remains untouched as magma in the molten mass in the glassy rest. Di-calcium silicate which carries some di-calcium ferrite in solution, has a yellow color.

Celite has a red-brown color; it consists of di-calcium compounds and is mostly not perfectly crystallized and completely separated from the molten mass, the glassy residue, which we have to regard as an alkali-lime glass containing magnesia ferrite, calcium ferrite, calcium sulphate and calcium sulphide. Manganese, which occurs almost invariably in very small amount, is present as calcium manganite or as alkali-manganate. A reducing flame, however, may considerably change the constitution of the clinker. Iron and manganese may be reduced to lower oxides, thus becoming bases and acting the same part as the lime, while, when burnt with an oxidizing flame, they act as acids upon the lime. Reducing fire, therefore, always injures the cement, and the result may be that a cement raw mixture, high in lime, yields a blowing cement, when burnt with a reducing flame, while, when exposed to an oxidizing fire, it would have resulted in a perfectly sound cement.

Portland cement, therefore, may consist of:

1. Alite alone, if the raw materials contain no iron.
2. Alite and Celite; but it mostly contains:
3. Alite, Celite, Belite and Felite, and a glassy rest.

The composition of belite has so far not been accurately determined by anybody. Toernebohm and afterwards Kappen have declared belite to be active di-calcium silicate (that is to say, di-calcium silicate which is able to harden), which should be discolored by di-calcium ferrite; but if this be true, belite should always be present, which is not so; besides, it ought to be present in much larger quantities and be translucent and not opaque. Moreover, the existence of di-calcium silicate is very doubtful. I regard belite as a calcium aluminate, which has remained undissolved by the calcium silicate, as tri-calcium di-aluminate, 2 Al_2O_3, 3 CaO. Belite has exactly the same color as this aluminate, namely, that of unbleached, slightly red wax, and is equally non-transparent. The belite of the cement clinker looks like droplets which have been in a fused state and is double-refracting; Al_2O_3, CaO and 2 Al_2O_3, 3 CaO are the only known double-refracting aluminates. Belite is no longer noticeable in the clinker if the raw mixture is very high-limed, that is to say, if more easily fusing tri-calcium aluminate can be formed which can be completely dissolved in the so-called tri-calcium silicate.

Felite, which is regarded as inactive di-calcium silicate, is likewise not a necessary ingredient in the calcined Portland cement; on the contrary, it is rather undesirable. It is the calcium silicate which forms when the clinker is cooled slowly; it does not possess hydraulic properties.

If the dissociation of the solution of di-calcium aluminate in calcium silicate takes place on a larger scale, the clinker disintegrates to a fine powder on cooling. It is a well-known fact, that this disintegration can be prevented by fast cooling.

A clinker obtained by fusion of a thoroughly mixed and high-limed raw mixture consists, if quickly cooled, solely of alite and celite; every well vitrified cement clinker, if burnt in a short time and quickly cooled, approaches this composition and contains the more alite the higher in lime the raw mixture has been.

You all know that Mr. S. B. Newberry has obtained almost pure so-called tri-calcium silicate, which hardened well and was perfectly sound, that is to say, a solution of about 3 CaO in 2 SiO_2, 3 CaO. A sample of it, which I analyzed, showed the following composition:

SiO_2 = 26.961%
R_2O_3 = 0.060 "
CaO = 72.446 "
Loss at red heat = 0.533 "

100.000%

We therefore might say, if we would not regard alite as the principal constituent of Portland cement, that Portland cement may also consist:

4. Solely of so-called tri-calcium silicate; but this would be only of theoretical value, because it would require very pure raw materials and an extraordinarily high temperature in order to obtain a sound cement this way. Finally, I will mention that the best Portland cement becomes rapidly inferior by prolonged burning at from 900° to 1000° centigrade; that is to say, at intense red heat. The calcium oxide which previously, at white heat, has been dissolved in the silicate, separates again.

In the preceding I trust I have given you, according to our present knowledge of the subject, a fairly comprehensive review of the constitution of the Portland cement clinker, underburnt Portland cement and Roman cements.

Now I will broach the hardening process, that is to say, the chemical and physical actions which take place when the cement combines with water. The calcareous hydraulic cements, as you know, do not form very stable compounds with water; even the moisture and carbonic acid of the atmosphere strongly act upon the latter. Hence it is easily conceivable, that all reagents have missed their aim, which have so far been used in the endeavor to obtain some insight into the constitution of the hardened compounds and thereby into the hardening process proper. All of them decompose the chemical compounds too far; even pure water breaks up these hydraulic compounds so completely that only the hydrates of silica, alumina and iron oxide remain. This I have demonstrated as early as forty years ago.

In a similar case, if all efforts remain unsuccessful, the best to do is to start over and over again, and thus I have returned since several years to water as reagent. If we consider the qualities which the water must possess, if it should act the least or not at all upon the hydraulic compounds, we find that it has to be lime-water. Consequently lime-water is the reagent which we have to use in our investigations of the hardening process of calcareous hydraulic cements.

At first it will appear unfeasible to you, that a reagent, in which the hydraulic compounds are supposed to be unchangeable, can be used for studying the process of transformation which they undergo during the hardening; but you will see in a short time that this is a useful method.

A saturated solution of lime-water can only be used for such hydraulic cements which readily combine with lime, for instance puzzuolanas and most slags; but half-saturated lime-water is generally applicable for determining if and how much lime has been absorbed from the solution or has been added to the solution, if a hydraulic cement undergoes the hardening process in the lime-water or with its aid. This way we are able to obtain insight into the hardening process.

It was known to me, that calcium-hydro-silicate is absolutely insoluble in lime-water, even if very diluted; furthermore, that calcium-hydro-ferrite is insoluble in it, and that the stable calcium-hydro-aluminates are likewise insoluble if the lime-water is sufficiently concentrated; but that the unstable aluminates, which are mostly formed the first, are slightly soluble and become colloidal; in the presence of calcium-hydro-silicate, however, these aluminates finally become completely insoluble in lime-water.

A preliminary experiment served to demonstrate how hydraulic lime or cement behaved towards lime-water of medium concentration, if different quantities of lime-water were used. For instance, 1 gram of the very finely pulverized substance was shaken for many months with 1 or 2 liters of such lime-water contained in air-tight flasks. The result was that 1 gram of hydraulic lime had given off to 1 liter of lime-water 0.158 gram and to 2 liters of lime-water 0.159 gram of calcium oxide, and that 1 gram of Portland cement had given to 1 liter of lime-water 0.246 gram, and to 2 liters 0.252 gram calcium oxide. This was regarded as sufficiently coincident in consideration of the many difficulties to be encountered. These difficulties are: (1) The moisture and carbonic acid of the atmosphere; (2) the incomplete decomposition of the larger grains of the substance; (3) the formation of little balls and sticking together of the substance in the beginning of the hydration.

Before I describe the experiments, however, I would like to make some remarks about the behavior of silica, alumina and iron oxide towards lime and magnesia.

It is well known, that amorphous silica energetically reacts upon calcium hydroxide under favorable conditions: how fast it sets and hardens depends only upon the density of the silica; the denser it is, the later reaction sets in and the harder is the hardened product.

Generally, silica and lime are supposed to set slowly, because the silica has become too dense by the burning process and consequently can hydrate only slowly; but it is still doubtful in which proportions they act upon each other. Seventy years ago J. N. Fuchs had rightly said in his excellent essay, that silica does not seem to combine in aqueous solution with more lime than found in wollastonite, SiO_2, CaO. By this he meant to say that in water the compound SiO_2, 2 CaO cannot be formed, and in this he was perfectly right.

On the other hand, we know gyrolith to be a compound of 9 SiO_2 with 2 CaO and 3 H_2O. Now, let us prepare a thorough mixture of the commercial very loose half-hydrate of silica with dry and equally loose calcium-hydrate (from 80 to 100 grams), and let us press this mixture into a tube of filter paper (4–5 cm. wide) which is enclosed in a glass (6–7 cm. wide) surrounded by sand in order to prevent loss of heat by radiation. Then let us insert a thermometer into the mixture and keep the whole apparatus at the temperature of the room for some time. If we pour now water of the temperature of the room into the glass until it reaches the upper edge of the filter paper tube, and close the tube with a lid and cover with sand, we at once notice, that the thermometer rises from 8 to 12° centigrade. This indicates a very strong reaction similar to that during the setting of a quick-setting cement. This action of silica upon water is physical adsorption, surface energy. After this has taken place the silica hydrate combines with the calcium hydrate. Here I show you the hardened pat, which possesses great strength considering the very loose powdery mass from which it originated; it has hardened up to this time in a moist chamber protected from carbonic acid, and represents a compound of 4 molecules of silica with 1 molecule of calcium oxide. An experiment in which 2 molecules of silica to 3 molecules of calcium oxide were used, showed an increase in temperature of 10° centigrade. As a matter of fact, silica combines in aqueous solution in all possible proportions with lime up to 2 molecules of silica to 3 molecules of calcium oxide, and, to begin with gyrolith, certainly in the proportions of from 9 SiO_2 to 2 CaO up to 2 SiO_2 to 3 CaO; the most remarkable of these compounds are 4 SiO_2 to 5 CaO and 4 SiO_2 to 6 CaO.

As early as 1895 I have demonstrated that silica is able to combine with lime in aqueous solution up to the proportions of 2 SiO_2, 3 CaO. Silica is only a very feeble acid at low temperatures, and this explains why it does not form distinctly defined stoichiometrical compounds. Furthermore, I may mention, that in a concentrated lime-water solution colloids easily precipitate lime simply by absorption of a certain quantity of water needed for dissolving the lime. In this case the lime is generally precipitated in form of microscopic hexagonal crystals, which are distinguished by their reflexion of light; but, in addition to this, amorphous lime may be precipitated on the surface of the colloids and imbedded in them.

If we add to silica, dissolved in water, so much lime-water that 1 molecule of SiO_2 and 2 to 3 molecules of CaO are present, a very bulky precipitate of calcium-hydro-silicate is formed instantaneously. Here I show you this compound, which represents a gelatinous mass, which may be compared with starch-paste. This specimen has been allowed to settle for many months in a 2-liter flask; in this state it was found to contain 25 times its weight of water; after having been strongly compressed it still contained 5 times as much water as silicate. If we dry this pressed cake over calcined lime or sulphuric acid, it acts just like glue, that is to say, it dries out to a very solid and hard mass which equals in strength hardened Portland cement.

In this case we have obtained the calcium salt of the tetra-ortho-silicic acid: 4 SiO_2, 5 CaO + 5 H_2O, when dried over SO_3, and 4 SiO_2, 5 CaO + 4.3 H_2O, when dried at 100° centigrade; hence it contains very likely 4 H_2O.

After all the water had been driven out at red heat, it became denser, and when exposed to white heat, its density was further increased, and yet it had not lost any of its hardness and solidity that it possessed in the hydrated state, which is a very remarkable and noteworthy appearance.

The same refers to the salt of the di-ortho-silicic acid, which is slightly higher in calcium oxide: 2 SiO_2, 3 CaO + 4 H_2O, dried over SO_3, and 2 SiO_2, 3 CaO + 3 H_2O, dried at 100° centigrade.

These hydro-silicates are the main constituents formed by a combination of all kinds of silica with calcium hydroxide, when submitted to the high-pressure hardening process invented by me, that is to say, in artificial sand-lime brick. If the process is properly directed no uncombined calcium hydrate should remain; which simply requires a sufficient quantity of powdered quartz sand, intimate mixing and sufficient time for hardening. If a perfect sand-lime brick thus obtained becomes brittle when exposed to fire, the cause of it is the sand, which increases its volume in the fire. In dealing with imperfect products, however, we have to add the unfavorable behavior of uncombined lime and of carbonate of lime, which may have been present from the start or has been formed in the course of time. The carbonate of lime and the free lime are converted into soft calcium oxide by the fire, which means a decrease in volume. The hydro-silicates likewise decrease their volumes on giving off water of combination, but their decrease in volume is of no disadvantage, because they form only thin films around the quartz grains; moreover, the hardness which they possessed in the hydrated state is not lost on dehydration by the heat; on the contrary, dehydrated calcium silicate is even denser and stronger.

Investigators have frequently studied the barium compounds of the various silicic acids in the hope of obtaining a clew to the formation of the calcium-hydro-silicates; but this has never been accompanied by success; they should have compared them with the magnesia-hydro-silicates, which are perfectly analogous, but much more stable compounds; therefore we find them frequently in nature, whereas the very unstable calcium-hydro-silicates can only rarely be found.

In the following I give a comparison of the principal hydro-silicates of magnesia and calcium oxide:

Meerschaum	3 SiO_2, 2 MgO + 2 H_2O	Gyrolit	9 SiO_2, 2 CaO + 3 H_2O
Talc	10 " 8 " + 5 "	Okenit	2 " 1 " + 2 "
Soap-stone	8 " 6 " + 3 "	Apophyllit	5 " 3 " + 9 "
Pikrosmin	1 " 1 " + 1 "	**?Winklerit**	1 " 1 " + 1 "
Aphrodit	1 " 1 " + 2 "	Plombièrit	1 " 1 " + 2 "
Pikrophyll	3(1 " 1 ") + 2 "	LeChatelier's	2(1 " 1 ") + 5 "
Kerolith	2(1 " 1 ") + 3 "		
Gymnit	3 " 4 " + 2 "	**?Landrinit**	3 " 4 " + 4 "
Spadait	6 " 5 " + 4 "	**Smeatonit**	4 " 5 " + 5 "
Serpentine (Asbestos)	2 " 3 " + 2 "	**Vicatit**	2 " 3 " + 3 "

The lime compounds given in **black type** are named by me, those with a question mark are only theoretical compounds. You will observe a remarkable coincidence.

The reason why the magnesia hydro-silicates and calcium hydro-silicates do not crystallize, but are amorphous, certainly must be ascribed to their absolute insolubility in water, as not a trace of silica is found to be dissolved in water, as long as it contains lime; only after removal of all of the lime the silica begins to dissolve. Okenit and apophyllit are crystallized minerals; the latter contains besides calcium oxide a small percentage of potassium.

All these compounds can easily be obtained by my high-pressure hardening process. Of practical importance might possibly become the manufacture of meerschaum, which has been artificially made by me by this method many years ago. At ordinary temperatures silica and magnesia hydrate do not act upon each other; only solutions of magnesia are able to do so.

The conclusions to be drawn from the foregoing are the following: The hydro-silicates of the hydraulic cements are never crystallized and silica is unable to combine in aqueous solution with more than one and one-half molecules of calcium oxide, thus forming the calcium salt of the di-ortho-silicic acid; this calcium compound, highest in lime, which I have called vicatit, is analogous to serpentine and is formed especially as the result of the decomposition of the hydraulic compounds over-saturated with lime. Smeatonit, which name I have given to the calcium salt of the tetra-ortho-silicic acid, is formed in the puzzuolana mortars by combination of silica and calcium hydroxide. We have to consider, however, that well-defined hydro-compounds of silica and calcium oxide hardly ever are formed and that consequently it would be more correct to say, that the calcium salts of the di-ortho-silicic acid, tri-ortho-silicic acid and tetra-ortho-silicic acid come the nearest to those actually formed.

As to the calcium aluminates and calcium ferrites, I find that mono-calcium compounds are out of the question; however, we observe tri-calcium di-aluminate and tri-calcium di-ferrite, di-calcium compounds, penta-calcium di-aluminate and tri-calcium aluminate. These compounds are to be found in Roman cement and underburnt Portland cement; but in well vitrified and in fused Portland cement if burnt from well prepared raw mixtures, uncombined aluminates do not exist; but uncombined ferrites may be found. If, on account of imperfect mixing or burning a high percentage of uncombined vitrified aluminates be present in Portland cement, such cements are subject to air-slacking, especially if the clinker contains a considerable amount of tri-calcium di-aluminate, that is to say, "belite."

Concerning the magnesia, the prevailing opinion is, that it is contained in the clinker in an uncombined state as calcined magnesia, which hydrates only after a very long time, when the cement has almost finished its hardening process, and, as the process of hydration of the magnesia is accompanied by an increase of volume, this is described to cause, often only after a period of several years, injurious internal stresses of such force that the cohesion of the mortar may be destroyed. This fact exists; but nevertheless it is impossible that the cement clinker contains uncombined magnesia, unless it be present in very large amounts, that is to say, exceeding 6 per cent; for magnesia clinkers and fuses with alumina and iron oxide even more readily than lime, and a mixture of lime and magnesia is certainly apt to fuse even more easily than each of these two bases separately.

He who has burnt two kinds of cement from the same raw materials and under the same conditions, of which one contained the ordinary 1 or 2 per cent magnesia and the other from 6 to 10 per cent magnesia, cannot have failed to observe the striking change caused by the magnesia. The clinker high in magnesia is much denser and has an entirely different color, namely, red-brown or bluish-red. This discoloration is evidently caused by at least two, but more likely by three, ingredients, magnesia and iron oxide and alumina. A combination of these fuses most easily. Therefore I am convinced, that the magnesia is contained in the cement clinker principally as di-magnesium-ferrite; if the magnesia exceeds 2 per cent, magnesia aluminate may be formed in addition to the former, and only after all of the iron oxide and alumina has combined with magnesia available for this purpose, uncombined magnesia can exist. With the silica of the cement clinker the magnesia does not enter into combination, for every particle of the silica is eagerly seized by the lime. Another proof for the inability of the magnesia to combine with the silica is the fact that since a long time magnesia has been entirely neglected in the calculation of cement raw mixtures; this means the magnesia has been assumed to be unable to replace the lime, and the results have invariably proved the correctness of this method.

About twenty years ago, when the discussion about the permissible amount of magnesia began, I cautioned against exaggerating the injurious influence of the magnesia in Portland cement, as I had never observed any defects with cements containing up to 5 or 6 per cent of magnesia, if I had entirely neglected the magnesia in calculating the raw mixture. I have been severely criticized at that time, but succeeded in convincing you of the correctness of my statements by the following experiments:

I took Portland cement raw mixture from the Portland cement works, "Stern," which, when burnt, yielded a clinker of the following composition:

Silica	22.88 %
Alumina plus Iron Oxide	10.20 "
Lime	65.00 "
Magnesia	1.12 "
Sulphuric Acid	0.39 "
	99.59 %

To this raw mixture I added finely pulverized calcined magnesia, so that five cements resulted, which contained:

A (original substance)	1.12%	Magnesia
B	3.90 "	"
C	4.36 "	"
D	4.82 "	"
E	5.29 "	"

All of the five mixtures were burnt in exactly the same way: A yielded a greenish black clinker, and B to E red-brown clinker; all of them were ground to the same fineness, and 1 per cent of gypsum was added in each case in order to make them slow setting. Then all were made into Bauschinger bars, namely, series I immediately after the manufacture of the cements and series II sixteen weeks afterwards after having seasoned for this time. One set of test pieces was kept in water, another in air. The bars given under "R" are made of neat cement plus 19 per cent of water, those under "S" consist of 1 cement, 3 standard testing sand, and 0.39 water.

The test pieces have been measured the first time the second day after being made, after the center-punch-plates had been sufficiently cemented in; thereafter they were measured again after fourteen days; one, two, three and six months; one, two, three, four, five, six and ten years. For our purpose it suffices to report the first and last readings in each case:

I. BARS MADE OF FRESH CEMENT; FIRST READING, JULY 22, 1890.

		A	B	C	D	E
Kept in water	R	101.3365	101.0440	100.8860	100.9315	101.2190
	S	100.9275	100.4725	100.4490	100.4935	101.0225
Kept in air	R	100.9740	100.7675	100.6735	100.9770	101.0445
	S	101.1100	100.6300	100.1350	100.8485	100.7300

TEN YEARS AFTERWARDS.

		A	B	C	D	E
Kept in water	R	101.4290	101.1590	101.0080	101.1100	101.3590
	S	100.9480	100.5050	100.5410	100.5590	100.9820
Kept in air	R	100.7840	100.5860	100.4900	100.7910	100.8470
	S	100.9800	100.5080	100.0150	100.7240	100.6070

II. BARS MADE OF CEMENT AFTER SIXTEEN WEEKS' SEASONING; FIRST READING, NOVEMBER 18, 1890.

		A	B	C	D	E
Kept in water	R	101.1300	101.7100	101.0775	102.0100	101.6440
	S	100.5250	100.9650	100.4800	101.2375	100.3950
Kept in air	R	101.3250	101.1675	101.2025	101.4300	100.7200
	S	100.4700	101.3275	100.6600	100.5565	101.3750

TEN YEARS AFTERWARDS.

		A	B	C	D	E
Kept in water	R	101.1850	101.8350	101.2070	102.1450	101.7980
	S	100.5330	100.9830	100.5050	101.2750	100.4450
Kept in air	R	101.0350	100.8950	100.9200	101.1400	100.4300
	S	100.3600	101.2270	100.5760	100.4760	100.8050

Between the first and last measurements no irregularities have been observed, and injurious stresses have not been noticed in a single case. Therefore 5 per cent of magnesia may safely be allowed in a Portland cement.

For further experiments I took cement raw mixture of the Portland cement works, "Stern," and prepared a second mixture from dolomite from Karlstadt and clay from the "Stern" works, which had the same ratio, $\frac{CaO}{SiO_2 + R_2O_3} = 2.05$, as the Stern raw mixture. From these I burnt three cements exactly in the same way: A from pure Stern raw mixture containing about 1 per cent magnesia; B from a mixture of one-half Stern raw mixture and one-half of the second mixture ("dolomite mixture") containing about 16 per cent magnesia, and C from pure dolomite mixture containing 30 per cent magnesia. These three cements were made into briquettes, 1 cement to 3 standard sand, and kept in water. They showed the following tensile strength given in kilograms per square centimeter:

	A	B	C
Age, 7 days	15.5	13.2	10.5
" 28 "	25.1	19.0	12.8
" 90 "	28.5	24.4	14.2
" 365 "	33.8	25.8	10.2

Each of these figures represents an average of ten briquettes.

B shows a marked difference if compared with A, as far as the increase from 90 to 365 days is concerned, and C shows from the beginning a very low strength, which finally decreases, and this indicates increasing internal stresses. These, however, are two cements with unusually high percentages of magnesia (16 and 30 per cent).

Here I show you a slab and a cube made of the neat cement "C," which have hardened under water for eighteen years. The slab is slightly bent, but on superficial examination does not show fissures, and the cube has apparently remained unaltered.

(The compressive strength of this cube was afterwards found to be 94 kilograms per square centimeter. Before being submitted to this test, it had to be polished carefully for the purpose of removing incrustations on its surface. Then it was found that the cube as well as the polished slab were fissured; some of these fissures were several millimeters wide. The cube had expanded 4 millimeter in all directions, that means it had increased its volume from 100 to 119. The cube was very hard, but nevertheless had almost completely lost its cohesion and possessed hardly the twelfth part of the strength to be expected from a sound cement.)

The principal question which occurs now is, whether or not the magnesia replaces the lime. The composition of the three cements was the following:

	A	B	C
Silica	=22.80%	19.43%	16.12%
Alumina	= 5.59 "	5.03 "	4.08 "
Iron Oxide	= 2.88 "	2.62 "	2.30 "
Lime	=64.11 "	55.51 "	46.12 "
Magnesia	= 1.10 "	15.60 "	30.05 "
Calcium Sulphate	= 1.90 "	1.45 "	1.22 "
Calcium Sulphide	= 0.95 "	... "	... "
	99.33%	99.64%	99.89%

If the magnesia would act the same way as the lime, we would have, in the case of cement "B," the ratio (in per cent)

$$\frac{CaO + MgO}{SiO_2 + R_2O_3} = 2.626$$

and with "C" a ratio of 3.385, or, expressed in molecular weights, B = 3.6 and C = 4.8; this would be impossible, of course; such cements would be immediately destroyed by blowing.

If, on the other hand, we assume the magnesia to have combined in the first place with the iron oxide to di-magnesia ferrite and further with the alumina to tri-magnesia aluminate, and the remaining magnesia to be in an uncombined state, we have in cement "B" 19.43 silica to 55.50 calcium oxide, and in "C" 16.12 silica to 46.12 calcium oxide, that is to say, in molecular weights 1 SiO_2 to 3.05 CaO; in this case we have cements with the highest limit of lime, the so-called tri-calcium silicate. This fact, that bending, fissures and injurious stresses have been observed with cement "C" only after several years, perfectly corresponds with the behavior of magnesia calcined at 1500° centigrade. Direct experiments with admixtures of magnesia, calcined to a point of vitrification, to sound Portland cement have showed after a few years the same defects, namely, bending and cracking.

Cement "C" contains 24 per cent magnesia, which has remained uncombined, and 23 per cent calcium oxide, which has been set free during the hardening process. The magnesia hydrates only after the hardening process has been completed, and this hydration takes place in the ratio of 24 parts of magnesia to 11 parts of water. The specific gravity of well-calcined magnesia is 3.35 and that of the magnesia hydrate only 2.35. Consequently become of $\frac{24}{3.35} = 7.16$ parts by volume $\frac{24 + 11}{2.35} = 15$ parts by volume of MgH_2O_2; that is to say, the volume of the magnesia is doubled by hydration.

By the foregoing I trust to have proven that I am right in treating the magnesia in Portland cement as not equivalent to the lime and in describing it as an ingredient which is unable to form hydraulic compounds with the silica, evidently because the lime monopolizes the silica.

The magnesia, therefore, has nothing

to do with alite, the principal constituent of Portland cement, and if Dr. Unger claims to have found invariably magnesia in the crystals of fused cement, the reason for this is that he has always obtained a mixture of alite and celite crystals, white, yellow and green crystals mixed together. Alite, however, is entirely white; the magnesia, therefore, was contained in the celite. Moreover, Unger's cement has not been a genuine Portland cement; it had been fused in a reducing fire and contained the iron not in the form of an acid but as a base.

The same behavior, which has been hitherto ascribed to the uncombined sintered magnesia, namely, its late hydration and accompanying expansion, would likewise apply to magnesia ferrite and calcium ferrite, because the ferrites, if vitrified or fused, are those calcium and magnesia compounds of the cement which are decomposed by water with the greatest difficulty, and which hydrate only very late. Finally, if we would assume the magnesia to be combined with silica as SiO_2, 2 MgO, it seems to be out of the question that this compound will ever be decomposed and hydrate.

As to the behavior of the sulphuric acid in the cement, the following may be stated: Whenever calcium sulphate comes in contact with hydraulic cements containing alumina, calcium-sulpho-aluminates are formed. We may take any cement, Portland cement, Roman cement, hydraulic lime or slag cement, and add about three or four times as much gypsum to it as the sample contains alumina. If we shake such a mixture with a large surplus of water for, say, six to eight weeks, in order to prevent hardening, we observe continual swelling of the mass and a steady decrease in sulphuric acid. Finally, we can no longer discover any sulphuric acid in the water, because the calcium-sulpho-aluminates that have been formed are insoluble in the lime-water, which is likewise a product of the chemical process that has taken place. Microscopical investigation reveals innumerable needle-crystals of calcium-sulpho-aluminate.

After having given you all necessary preliminary information, I will describe some experiments which will show the results to be obtained from treating calcareous hydraulic cements with lime-water.

As previously mentioned, lime-water of medium concentration has been used for all high-limed cements and concentrated lime-water only for puzzuolanas.

In carrying on these experiments it is of the greatest importance to analyze the substance as accurately as possible (silica must always be evaporated twice); the sample must be pulverized very finely and care must be taken that not little lumps are formed by caking together of the particles, when the substance is brought in contact with the water; in addition to this the effects of the carbonic acid of the atmosphere must be excluded as far as possible. The treatment has to be continued for many months in air-tight flasks.

Example I.—Portland Cement "A":

CHEMICAL COMPOSITION.

Silica	SiO_2	= 21.198 %
Alumina	Al_2O_3	= 7.370 "
Iron Oxide	Fe_2O_3	= 3.068 "
Manganese Oxide	Mn_2O_3	= 0.136 "
Lime	CaO	= 65.545 "
Magnesia	MgO	= 1.101 "
Potassium Oxide	K_2O	= 0.514 "
Sodium Oxide	Na_2O	= 0.200 "
Calcium Sulphate	$CaSO_4$	= 0.840 "
		99.972 %

2 g = 200 cg have been treated with 1 liter of lime-water containing 0.500416 g CaO
After having been shaken for three months, the lime-water contained 0.999758 g CaO
The hardening cement, therefore, had given off .... 0.499342 g CaO
Or 100 cg had given off .... 0.249671 g CaO

The magnesia has been figured as Fe_2O_3, 2 MgO, and the remaining amount of Fe_2O_3 has been calculated as Fe_2O_3, 2 CaO.

All of the calcium sulphate has been figured as calcium - sulpho - aluminate, "Al_2O_3, 3 CaO + 3 $CaSO_4$"; 0.8400 per cent $CaSO_4$, therefore, require 0.2105 Al_2O_3 and 0.3463 CaO.

Manganese and alkalies need not be taken into account, as the alkalies go into solution and likewise part of the manganese; larger quantities of manganese are dealt with like iron oxide.

1.101% MgO combines with 2.202 Fe_2O_3; there remain 0.866% Fe_2O_3, requiring 0.6062% CaO.

Consequently 1 gram of the cement had given off the following amount of lime:

Given off to the solution	0.249671 g CaO
Given off to sulpho-aluminate	0.003463 " "
Given off to Fe_2O_3, 2 CaO	0.006062 " "
Total	0.259196 g CaO

In the hydrates have remained:

$$\begin{array}{llll} SiO_2 = 21.1980\% = 0.353300 \text{ molecules} & >< \frac{3}{2} = & 0.529950 & \text{molecules CaO} \\ Al_2O_3 = 7.1595 \text{ "} = 0.070050 \quad \text{"} & >< \frac{5}{2} = & \underline{0.175125} & \text{" \quad "} \\ CaO = 39.6254 \text{ "} = 0.707596 \quad \text{"} & & 0.705075 & \text{molecules CaO} \end{array}$$

Hence have been formed:

$$\underline{2\,SiO_2,\ 3\,CaO + aq, \text{ and } 2\,Al_2O_3,\ 5\,CaO + aq.}$$

SiO_2, 2 CaO + aq cannot have been formed, because in this case no CaO would remain for Al_2O_3. Zulkowski claims that calcium aluminates are decomposed by water into calcium hydrate and alumina hydrate; a simple experiment, however, shows that this cannot be so. There is no calcium aluminate which would leave merely Al_2O_3, 3 H_2O, even when treated with twice or three times as much water as required for dissolving the lime it contains; only a very small amount of lime, mostly also a little alumina, go into solution, and a calcium-hydro-aluminate always remains. There are quite a number of such aluminates, of which, for our purposes have to be taken into account the hydrates of the following compounds: 2 Al_2O_3, 3 CaO; Al_2O_3, 2 CaO; 2 Al_2O_3, 5 CaO, and Al_2O_3, 3 CaO.

Example Ia.—1 gram of the same Portland cement "A" was treated with 690 ccm. of distilled water, that had previously been boiled; in this case lime-water was formed as the result of the decomposition.

The water had absorbed	0.274890 g CaO
The sulpho-aluminate required	0.003463 " "
Fe_2O_3 2 CaO required	0.006076 " "
	0.284429 g CaO

Consequently remained in the hydrates:

$$\begin{array}{r} 65.545\%\ CaO \\ -28.443\ \text{"}\quad\text{"} \\ \hline 37.102\%\ CaO = 0.662536\ \text{Molecules.} \end{array}$$

The following compounds, therefore, have been formed:

$$\begin{array}{llll} SiO_2 & = 0.353300\ \text{mol.} & >< \frac{3}{2} & = 0.52995 \\ Al_2O_3 & = 0.070050\ \text{"} & >< 2 & = 0.14010 \\ \hline CaO & = 0.662536\ \text{"} & & = 0.67005 \end{array}$$

$$\underline{2\ SiO_2,\ 3\ CaO + aq + Al_2O_3,\ 2\ CaO + aq.}$$

EXAMPLE Ib.—In order to eliminate the alumina and to study solely the saturation of the silica with lime, 1 gram of the same cement "A" was mixed with so much gypsum that all alumina could be converted into calcium-sulpho-aluminate.

1 g of the cement was treated with 1 liter of lime-water containing	0.514325 g CaO
After reaction had taken place, the lime-water contained	0.773129 " "
Hence, taken up by the water	0.258804 g CaO
Taken up by Fe_2O_3, 2 CaO	0.006076 " "
Taken up by sulpho-aluminate	0.121223 " "
	0.386103 g CaO

The cement contained:

$$\begin{array}{r} 65.545\%\ CaO \\ -38.610\ \text{"}\quad\text{"} \\ \hline 26.935\%\ CaO = 0.480982\ \text{mol.} \\ SiO_2 \qquad\qquad = 0.353300\ \text{"} \end{array}$$

In this case does not remain enough calcium oxide for the formation of 2 SiO_2, 3 CaO; hence, either

$$\underline{3\ SiO_2,\ 4\ CaO + aq}$$

$$(0.3533 >< \frac{4}{3} = 0.471068)$$

or $\underline{4\ (2\ SiO_2,\ 3\ CaO + aq) + 5\ (4\ SiO_2,\ 5\ CaO + aq)}$ is formed.

EXAMPLE II.—1 g Portland cement "B" was treated with 1 liter of lime-water containing 0.6146 CaO.

CHEMICAL COMPOSITION OF CEMENT "B."

Silica	SiO_2	= 24.018 %
Alumina	Al_2O_3	= 5.372 "
Iron Oxide	Fe_2O_3	= 2.545 "
Lime	CaO	= 67.013 "
Magnesia	MgO	= 0.957 "
Potassium Oxide	K_2O	= 0.082 "
Sodium Oxide	Na_2O	= 0.208 "
Calcium Sulphate	$CaSO_4$	= 0.260 "
		100.455 %

The 0.260 $CaSO_4$ require	0.064 Al_2O_3
and	0.107 CaO
0.957 MgO combine with	1.914 Fe_2O_3
There remain 0.631 Fe_2O_3, requiring	0.4417 CaO
After having been shaken for three months, the lime-water contained	0.8876 g CaO
	−0.6146 " "
The water had absorbed	0.2730 " "
The sulpho-aluminate required	0.00107 " "
Fe_2O_3, 2 CaO required	0.004417 g CaO
Total amount given off	0.278487 g CaO

In the hydrates remained:

$$\begin{array}{llll} SiO_2 & = 24.018\% = 0.400300\ \text{mol.} & >< \frac{3}{2} & = 0.60045\ CaO \\ Al_2O_3 & = \ \ 5.308\ \text{"} = 0.051940\ \text{"} & >< 2 & = \underline{0.10388\ CaO} \\ CaO & = 39.164\ \text{"} = 0.699357\ \text{"} & & \ \ 0.70433\ CaO \end{array}$$

Consequently have been formed. $\underline{2\ SiO_2,\ 3\ CaO + aq \text{ and } Al_2O_3,\ 2\ CaO + aq.}$

Smeatonit, $4\ SiO_2,\ 5\ CaO + aq$, would require 0.500375 CaO; then would remain for Al_2O_3: $\frac{0.198972}{0.051940} = 3.83$ CaO; hence, almost Al_2O_3, 4 CaO, which is unlikely, but not at all impossible, namely Al_2O_3, 3 CaO, with an admixture of 0.83 CaO.

Example III.—1 g underburnt Portland cement "C" was treated with 500 ccm. of distilled water (previously boiled). This showed an entirely different behavior from standard (that means well vitrified) Portland cement. Alumina was freely dissolved, and colloidal calcium aluminate was kept in suspension.

COMPOSITION OF CEMENT "C."

Silica	SiO_2	=	23.297 %
Alumina	Al_2O_3	=	4.655 "
Iron Oxide	Fe_2O_3	=	1.969 "
Lime	CaO	=	66.251 "
Magnesia	MgO	=	1.009 "
Potassium Oxide	K_2O	=	0.581 "
Sodium Oxide	Na_2O	=	0.122 "
Calcium Sulphate	$CaSO_4$	=	2.144 "
			100.128 %

The water had absorbed 0.22471 g CaO. In underburnt cement the magnesia is assumed to be uncombined; the iron oxide is figured to go into the same combinations as the alumina.

2.144 $CaSO_4$ require	0.536	Al_2O_3
	and 0.884	CaO
Taken up by the water	0.22471	g CaO
Taken up by sulpho-aluminate	0.00884	" "
Total amount absorbed	0.23355	g CaO

In the hydrates remained:

$$SiO_2 = 23{,}397\% = 0.38995 \text{ mol.} \quad >\!< \frac{3}{2} = 0.584925 \text{ CaO}$$

$$\left.\begin{array}{l} Al_2O_3 = 4.119 \text{ " } = 0.04030 \text{ "} \\ Fe_2O_3 = 1.969 \text{ " } = 0.01231 \text{ "} \end{array}\right\} >\!< 3.44 = \underline{0.180978 \text{ CaO}}$$

$$\begin{array}{ll} CaO = 42.896 \text{ " } = 0.76600 & \qquad 0.765903 \text{ CaO} \\ MgO = 1.c99 \text{ "} & \end{array}$$

The compounds formed are: $\underline{2\ SiO_2,\ 3\ CaO + aq \text{ and } R_2O_3,\ 3.44\ CaO + aq.}$

In this case it is very likely that calcium hydroxide has been precipitated on the colloids.

For the formation of SiO_2, 2 CaO + aq the amount of lime present would be insufficient, even if we would assume alumina hydroxide and iron hydroxide not to be combined with lime, which is impossible, as the hydrates formed are white.

$$Fe_2O_3,\ 3\ CaO + aq \text{ and } Fe_2O_3 \left\{\begin{array}{l} 3\ CaO + aq \\ CaO + aq \end{array}\right. \text{ are white compounds.}$$

Example IV.—2 grams of freshly calcined Roman cement were treated with 1 liter of lime-water containing 0.53254 g CaO.

COMPOSITION OF CEMENT.

Silica	SiO_2	=	25.720 %
Alumina	Al_2O_3	=	9.380 "
Iron Oxide	Fe_2O_3	=	3.683 "
Lime	CaO	=	45.379 "
Magnesia	MgO	=	4.032 "
Calcium Sulphate	$CaSO_4$	=	5.251 "
			93.454 %

The calcium-sulpho-aluminate formed by the Roman cement had the composition: $2(Al_2O_3,\ 3\ CaO) + 5\ CaSO_4 + aq$.

5.251 $CaSO_4$ require 1.575 Al_2O_3 and 2.594 CaO.

Iron oxide and alumina are figured together. Magnesia is uncombined and forms magnesia hydroxide.

After three months the lime-water contained	0.62178 g CaO
	−0.53254 " "
	0.08924 g CaO
Hence 100 cg	0.04462 " "
For formation of sulpho-aluminate	0.02594 " "
Total amount absorbed	0.07056 g CaO

In the hydrates remain:

$$SiO_2 = 25.720\% = 0.42867 \text{ mol.} \quad >\!< \frac{5}{4} = 0.5358375 \text{ CaO}$$

$$\left.\begin{array}{l} Al_2O_3 = 7.814 \text{ " } = 0.07646 \text{ "} \\ Fe_2O_3 = 3.683 \text{ " } = 0.02302 \text{ "} \end{array}\right\} >\!< \frac{3}{2} = \underline{0.1492200 \text{ "}}$$

$$\begin{array}{ll} CaO = 38.323 \text{ " } = 0.68434 & \qquad 0.6850575 \text{ CaO} \\ MgO = 4.032 \text{ "} & \end{array}$$

Consequently have been formed: $\underline{4\ SiO_2, 5\ CaO + aq + 2\ R_2O_3, 3\ CaO + aq.}$

EXAMPLE IVa.—2 g of the same Roman cement; commercial product, that is to say, containing moisture and carbonic acid.

COMPOSITION OF CEMENT.

Silica	SiO_2	= 17.472 %
Alumina	Al_2O_3	= 7.265 “
Iron Oxide	Fe_2O_3	= 3.302 “
Lime	CaO	= 24.151 “
Calcium Carbonate	$CaCO_3$	= 27.450 “
Magnesia	MgO	= 3.537 “
Calcium Sulphate	$CaSO_4$	= 4.172 “
		87.349 %

4.172 $CaSO_4$ require 1.252 Al_2O_3 and 2.061 CaO.

After three months were found	0.7057 g CaO
1 liter lime-water contained	0.6529 “ “
Hence absorbed	0.0528 g CaO
Or by 100 cg	0.0264 “ “
The sulpho-aluminate contained	0.0206 “ “
Total amount given off	0.0470 g CaO

For the formation of hydrates, therefore, remain:

$$\begin{array}{lllll} SiO_2 & = 17.472\% & = 0.291200 & \text{mol.} & 0.291200 \\ Al_2O_3 & = 6.013 \text{“} & = 0.058836 & \text{“} & \left.\begin{array}{l} \\ \end{array}\right\} 0.079423 \\ Fe_2O_3 & = 3.302 \text{“} & = 0.020637 & \text{“} & \overline{} \\ CaO & = 19.450 \text{“} & = 0.347321 & \text{“} & 0.370673 \\ MgO & = 3.537 \text{“} & = 0.088425 & \text{“} & \end{array}$$

In this case there is not enough CaO available for the formation of mono-calcium compounds.

If we assume that $\underline{SiO_2, CaO + aq}$ have been formed, only enough CaO would remain to form Al_2O_3, CaO + aq, and iron oxide would remain uncombined or form iron hydroxide.

On the other hand, if we would include magnesia in our calculation, SiO_2, CaO + aq and R_2O_3, 2 CaO + aq might be formed. But everything points to it, that the magnesia is unable to combine with the acids.

EXAMPLE V.—1 g of Roman cement was treated with 1 liter of lime-water containing 0.6135 g CaO.

COMPOSITION OF CEMENT.

Silica	SiO_2	= 25.067 %
Alumina	Al_2O_3	= 10.468 “
Iron Oxide	Fe_2O_3	= 4.473 “
Lime	CaO	= 56.592 “
Magnesia	MgO	= 1.307 “
Calcium Sulphate	$CaSO_4$	= 0.384 “
		98.291 %

0.384 $CaSO_4$ require 0.1152 Al_2O_3 and 0.1897 CaO.

Found in lime-water	0.6958 g CaO
Previous contents	0.6135 “ “
Absorbed	0.0823 g CaO
In form of sulpho-aluminate	0.0019 “ “
Total amount absorbed	0.0842 g CaO

The hydrates, therefore, contained:

$$\begin{array}{lllll} SiO_2 & = 25.067\% & = 0.41779 & \text{mol.} & \times \frac{3}{2} = 0.62668\ CaO \\ Al_2O_3 & = 10.353 \text{“} & = 0.10127 & \text{“} & \left.\begin{array}{l} \\ \end{array}\right\} \times 2 = 0.25842 \text{ “} \\ Fe_2O_3 & = 4.473 \text{“} & = 0.02794 & \text{“} & \overline{} \\ CaO & = 48.172 \text{“} & = 0.86021 & \text{“} & 0.88510\ CaO \\ MgO & = 1.307 \text{“} & = 0.03267 & \text{“} & \end{array}$$

Hence have been formed: $\underline{2\ SiO_2, 3\ CaO + aq \text{ and } R_2O_3, 2\ CaO + aq.}$

EXAMPLE VI.—1 g of hydraulic lime (trade-mark, Lafarge I) has been shaken with 1 liter of lime-water containing 0.58921 g CaO.

COMPOSITION OF HYDRAULIC LIME.

Silica	SiO_2	= 22.101 %
Alumina	Al_2O_3	= 0.740 “
Iron Oxide	Fe_2O_3	= 0.775 “
Lime	CaO	= 57.877 “
Magnesia	MgO	= 1.632 “
Calcium Sulphate	$CaSO_4$	= 1.202 “
		84.327 %

1.202 $CaSO_4$ require 0.301 Al_2O_3 and 0.495 CaO.

In the lime-water was found	0.82686 g CaO
It previously contained	0.58921 " "
Consequently absorbed	0.23765 " "
The sulpho-aluminate required	0.00495 " "
Total absorbed	0.24260 g CaO

The hydrates contained:

$$\begin{array}{lllll}
SiO_2 & = 22.101\% = 0.36835 \text{ mol.} & >< \frac{3}{2} & = 0.552525 \text{ CaO} \\
Al_2O_3 & = 0.439 \text{ " } = 0.00430 \text{ " } & \rbrace >< 5.23 & = \underline{0.047775 \text{ " }} \\
Fe_2O_3 & = 0.775 \text{ " } = 0.00484 \text{ " } & & \\
CaO & = 33.617 \text{ " } = 0.60030 \text{ " } & & \, 0.600300 \text{ CaO} \\
MgO & = 1.632 \text{ " } = 0.04080 \text{ " } & &
\end{array}$$

Compounds formed: $\underline{2\ SiO_2,\ 3\ CaO + aq \text{ and } R_2O_3,\ 5.23\ CaO + aq.}$

Some of the substance seems to have remained undecomposed, so that a small amount of silicate has not been decomposed and therefore too much calcium oxide remained.

EXAMPLE VIa.—1 g of the same hydraulic lime was treated with lime-water to which 2.5 per cent sodium chloride had been added.

The lime-water had absorbed	0.25746 g
The sulpho-aluminate required	0.00495 "
Absorbed altogether	0.26241 g

$$\begin{array}{lll}
\text{There remained only: } 31{,}636\ \%\ CaO = & 0.56493 \text{ mol. } & CaO \\
0.36835 \text{ mol. } SiO_2 >< \frac{3}{2} & \underline{0.55253} \text{ " } & \text{ " } \\
 & 0.01240 \text{ " } & \text{ " } \\
0.00914 \text{ " } R_2O_3 & \underline{0.01240} \text{ " } & R_2O_3 = \frac{4}{3} \\
 & 0.09014 &
\end{array}$$

In this case have been formed: $\underline{2SiO_2,\ 3\ CaO + aq \text{ and } 3\ R_2O_3,\ 4\ CaO + aq.}$

I have so far experimented with about thirty different hydraulic cements, and hope to have all data ready for publication in a short time.

From the foregoing you have seen that mostly vicatit, 2 SiO_2, 3 CaO, 3 H_2O is formed; then smeatonit, 4 SiO_2, 5 CaO, 5 H_2O, and sometimes, also, winklerit, SiO_2, CaO, H_2O, and even lower-limed calcium-hydro-silicate may occur.

We have always to keep in mind, however, that in aqueous solution very seldom sharply-defined compounds of silica and calcium oxide are formed.

Many facts even point to the formation of double compounds of hydro-silicate and hydro-aluminate, as, for instance:

$$3\,[2\ SiO_2,\ 3\ CaO] + Al_2O_3,\ 3\ CaO + 12H_2O$$

$$\text{or } 3\,[4\ SiO_2,\ 5\ CaO] + 2\ Al_2O_3,\ 5\ CaO + 20H_2O$$

But for this we have at this time not sufficient proofs. The first period of the hardening process of hydraulic cements under the influence of water, called the setting, is generally attributed to the uncombined aluminates, but this does certainly not apply to well-vitrified Portland cement; for it does not contain uncombined aluminates, and if it contains belite, it is no longer a faultless cement. The normal clinker contains aluminates dissolved in alite and celite. The fused Portland cement manufactured by me fifteen years ago, which consisted almost exclusively of alite and contained very little celite, was quick-setting.

The alite, therefore, governs the setting time of the Portland cement, as it is the first acted upon and decomposed by the water; the more alite a cement contains and the more alumina this alite contains, the more quick-setting is the cement.

Alite,

$$6\,[3\ CaO + \underline{2\ SiO_2,\ 3\ CaO] + [3\ CaO + 2}\ Al_2O_3,\ 3\ CaO],$$

forms with water,

$$6\,(2\ SiO_2,\ 3\ CaO + aq) + 18\ CaH_2O_2$$

plus calcium-hydro-aluminate. Vicatit is a colloidal hydro-silicate, a lime-water glass; half of the lime of the so-called tri-calcium silicate is set free and is converted, by an exothermic reaction, at first likewise into colloidal calcium hydrate, which later on crystallizes from a saturated lime-water solution assisted by the dissolving alkalies.

Most of the tri-calcium aluminate is very likely decomposed to Al_2O_3, 2 CaO + aq, and 2 Al_2O_3, 5 CaO + aq; furthermore may be formed 2 Al_2O_3, 3 CaO + aq, and tri-calcium hydro-aluminate Al_2O_3, 3 CaO + 6 H_2O, especially under the stimulating influence of calcium sulphate.

All these formations of hydrates are exothermic reactions; yet the chief cause of hydration, setting and of generation of heat is the formation of calcium hydroxide. So far it has remained unnoticed that hydraulic silica, even when well-calcined, immediately adsorbs water under generation of heat. Celite is acted upon by water the less the smaller a percentage of calcium aluminate and the more calcium ferrite it contains. The lime-water that forms is the principal reagent acting upon celite. Calcium ferrite, vitrified or fused, hydrates only extremely slowly under the influence of lime-water. The hydration of the lime must go on uniformly throughout the whole mass, otherwise uneven stresses would arise, which would cause blowing of the cement. It is well known that a perfectly sound Portland cement, when recalcined after having hardened, results in blowing cement, because the lime had been deposited unevenly during the hardening process.

The crystals of calcium hydroxide, calcium-hydro-aluminate and calcium-sulpho-aluminate which are being formed find room for developing in the gelatinous compressible hydro-silicates and partly, also, in the hydro-aluminates. By their formation they gradually petrify the formerly elastic colloid, which by itself, on drying, becomes hard as a stone, as explained in the preceding; therefore, the colloid alone, without further assistance, is able to cement the grains of sand or the crystals imbedded in it, thus acting as a mineral glue (lime-water-glass). This mineral glue differs from organic glue inasmuch as it cannot soften again after once having given off its swelling-water; it cannot swell again and keeps its hardness.

This mineral glue, the calcium hydrosilicate, protects the iron in armored concrete from oxidation by covering it like a varnish.

The main phasis of the hardening process of hydraulic cements is due to the gradual giving off of the swelling-water, the progressing hardening of the colloids, the gradual hydration of the celite constituents, especially of the calcium ferrites of the celite, and, with Portland cement, in addition to the former causes, also to the continual formation of crystals of calcium hydrate.

The gelatinous calcium-hydro-silicates and calcium-hydro-aluminates (not all of the hydro-aluminates crystallize) possess the peculiarity of being perfectly waterproof, and therefore we find the inside of all the larger grains of cement in an unhydrated state, covered with a gelatinous film. This fact I demonstrated thirty years ago by pulverizing a neat cement briquette, which had hardened in water for many years. Such re-pulverized cements harden again, and the strength which they obtain is the higher the coarser the original cement has been.

Le Chatelier has observed the same with calcium aluminate.

From the preceding communications may be seen that the hardening process of hydraulic cements is not exclusively a chemical process, and that all investigators must be mistaken who maintain that the hardening is merely a process of crystallization from over-saturated solutions and of interlocking of needle-shaped crystals as with gypsum.

The hardening process is a combined action of colloids and crystalloids. The hardened cements contain: Water of constitution, water of crystallization, and water of colloids. The colloid-water causes much difficulty in the application of cements; it compels us to use lean mortars, in order to avoid decrease of volume.

I hope this new method of experimenting will prove beneficial to other investigators and trust that the various new ideas presented in this paper will be found to be an advance in our knowledge of the hardening process of hydraulic cements.

The Smith Machine Co. will erect a factory building at Milwaukee for the manufacture of the Smith concrete mixers. The building will cost $25,000.

Los Angeles Portland Cement Company of Los Angeles—Directors, E. Bouton, J. G. Hately, C. B. Lewis, C. W. Wardwell and E. S. Field. Capital stock, $2,000,000 and $5,000 subscribed.

A. H. Merrill, D. O. Douglass and other Toledo, Ohio, parties, will erect a factory on the Michigan Central tracks, between Georgia street and Central avenue, Toledo, for the construction of reinforced concrete burial vaults.

The Roman Nose Gypsum Co. has been incorporated, head office Jackson, Miss., by I. C. Enochs, J. L. Enochs, C. N. Bancroft, J. Ehrman, Wirt Adams, Ben H. Wells, T. E. Enochs, R. V. Powers, J. B. Nalty, W. M. Anderson and T. B. Gaddis and their associates and successors in interest, all of Jackson, Miss., to manufacture and deal in wall plaster, Portland cement, hydraulic lime. Capital stock, $250,000, of which $125,000 is paid.

The Superior Portland Cement Co. has purchased a tract of land at Center Station, Lawrence county, Ohio, on the line of the Detroit, Toledo & Ironton Railway. A 2,000-barrel mill will be erected. J. B. Johns of Wellston, Ohio, has been selected as general manager. J. B. Greenall of Allentown, Pa., will make plans and superintend the erection of the mill. Surveys for a switch track to the mill site from the D., T. & I. track are under way. Four hundred thousand dollars are to be invested in the plant.

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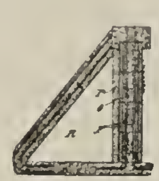
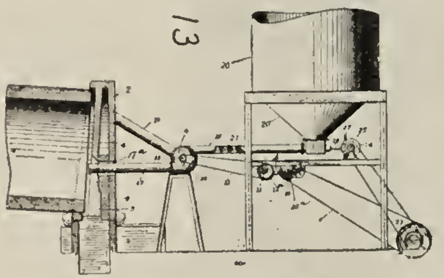
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

815,687. Retaining wall for reservoir. Lewis K. Davis, Indianapolis, Ind., assignor to Grace P. Davis, Indianapolis, Ind. Filed July 16, 1903. Serial No. 165,738.



A retaining wall for reservoirs and other uses, comprising hollow bricks or tiles arranged with their apertures in a vertical direction, and filled with a bituminous filler, and a concrete bracing for said wall forming a strut connected to the wall at one portion with an open space between the strut and the side of the wall, for substantially the purposes set forth.

815,705. Rotary Cement kiln. Harry Hitzel, Alpha, N. J., assignor to Alpha Portland Cement Company, Alpha, N. J., a corporation of New Jersey. Filed Oct. 31, 1904. Serial No. 230,774.

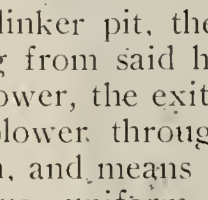


Claim.—The combination with the rotary kiln, the clinker pit, the hood having the chamber communicating with said clinker pit, the blower, the pipe leading from said hood chamber into said blower, the exit pipe leading from the blower through said hood into the kiln, and means for supplying a continuous uniform quantity of pulverized fuel into said blower, substantially as set forth.

815,886. Process of affixing plastics. Edward J. Winslow, Chicago, Ill. Filed May 15, 1905. Serial No. 260,460.

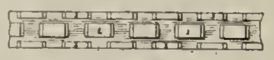
In a method of securely affixing a setting waterproof composition to water-soaked walls, the drying of a wall to the requisite degree by making a plurality of holes or channels in a part or parts of said wall, connecting thereto drainage-tubes, then applying the adherent composition to such dried wall and maintaining the drainage during the setting of said composition.

816,040. Apparatus for lining tunnels with concrete. Jesse W. Reno, New York, N. Y. Filed Sept. 9, 1904. Serial No. 223,938.



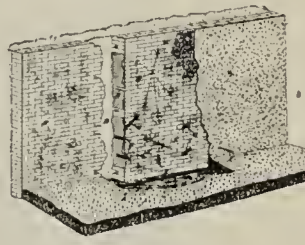
In tunnel construction, means for circumferentially and step by step lining the tube with concrete as the heading advances, comprising a temporary platform and approach bridges adapted to be advanced with the progress of the work, through tracks from entrance to heading passing over said bridges and platform, and subsidiary tracks upon said platform connecting with said through tracks.

816,334. Tension member for composite construction. Julius Kahn, Detroit, Mich., assignor to Trussed Concrete Steel Company, Detroit, Mich., a corporation of Michigan. Filed June 21, 1905. Serial No. 266,241.



Claim—A metal bar having a plurality of rows of disconnected projections extending from a side thereof, the projections of one row overlapping the gaps in each adjacent row, the projections being so proportioned that the bar shall be uniform in tensile strength throughout the portion of its length having such projections.

816,389. Slag cement and method of making the same. Joseph A. Shinn, Pittsburg, Pa. Filed July 8, 1901. Serial No. 67,544.



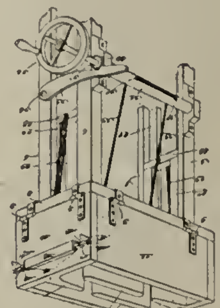
Claim—The method of making slag cement consisting in granulating basic slag, mixing this granulated slag with hydrated lime and dehydrated iron oxid and dry-grinding the mixture sufficiently fine that at least ninety per cent will pass through a two-hundred mesh screen; substantially as described.

2. The method of making slag cement, consisting in mixing granulated basic slag, hydrated lime and dehydrated iron oxid in the following proportions: seventy-five to ninety parts of slag, ten to twenty parts of lime, and three to fifteen parts of iron oxid, and then dry-grinding the mixture; substantially as described.

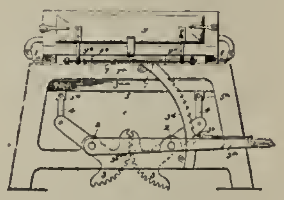
3. As a new composition of matter a slag-cement consisting of a finely-ground mixture containing seventy-five to ninety parts of basic slag, ten to twenty parts of hydrated lime and three to fifteen parts of iron oxid; substantially as described.

816,438. Cement block machine. Clarence F. Davis, Sherwood, Mich., assignor of one-half to A. Le Roy Locke, Bronson, Mich. Filed May 8, 1905. Serial No. 259,457.

In a machine of the class described the combination with a frame, of a mold, a bed plate secured to the frame and provided with a plurality of openings, side and end walls pivoted to the frame and adapted to engage the bed-plate, when in closed position, terminal locking-lugs secured to the side walls, a plurality of core members engaging the openings in the bed-plate and movable to operative and inoperative positions within the mold, a winding drum for operating said core members, means for locking the cores in inoperative position, means for returning said cores to operative position and gravity-actuated locking bars carried by the end wall.



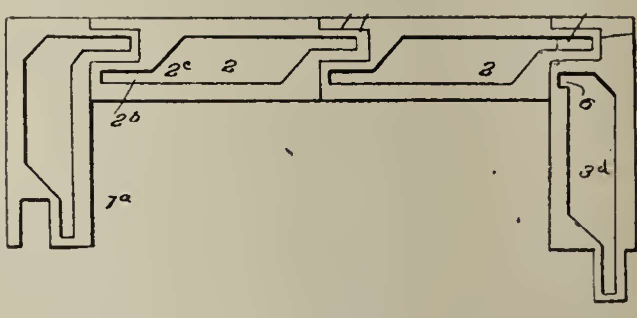
816,488. Cement block molding machine. Frank F. Martin, Beloit, Wis. Filed Apr. 11, 1905. Serial No. 255,018.



Claim.—A machine of the character described, comprising a stationary upright frame-support, end and lateral mold members arranged thereon and constituted of base portions one partially overlying the other and provided in their thus opposed surfaces with engaging slots and set bolts or screws, respectively, and of hinged or pivoted ends and sides proper connected to said base portions, and adapted for mutual retention in operative position.

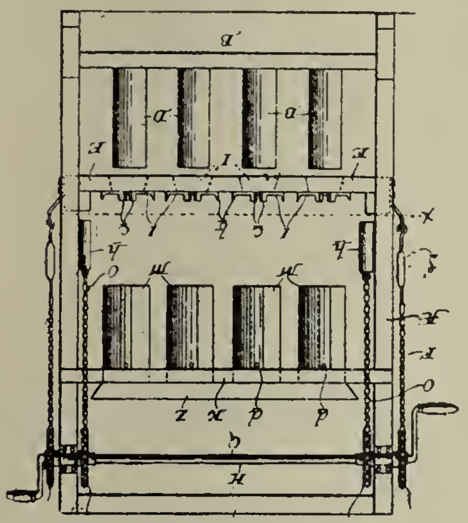
819,100. Building-Block. Isaac A. Vickerman, Preston, Minn. Filed May 22, 1905. Serial No. 261,646.

Claim.—A building wall constructed of building blocks, each block comprising a body formed with a longitudinal continuous vertical passage extending from one end of the block to the other, an extension projected from one end of the block longitudinally thereof, the passage aforesaid extending into and terminating in said extension, the opposite end of the block having a recess formed therein a longitudinal aline-



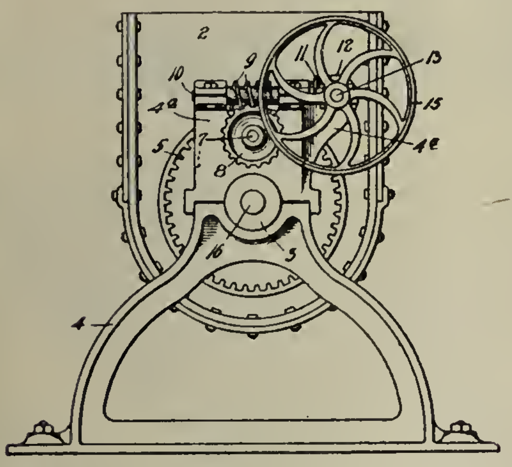
ment with the extension aforesaid, the passage in the block curving to one side of the recess above mentioned and overlapping the same, the extensions at the one end of the blocks being adapted to enter the recesses at the other ends of the blocks, when the several blocks are assembled in the wall structure, whereby frost or the like is caused to take a tortuous passage in penetrating the bodies of the blocks.

819,251. Cement Tile Machine. Luke R. Peck, Caro, Mich., assignor of one-half to Charles O. Thomas, Caro, Mich. Filed Jan. 26, 1906. Serial No. 297,956.



In a cement tile machine, the combination with an inner mold, of an outer mold adapted to diametrically expand and contract at least for a portion of its length, and an auxiliary outer mold formed of a single sheet of pliable material with overlapping ends provided with fastening devices detachably securing the ends together, said auxiliary molds adapted to form a non-adhesive lining for the outer mold in casting the tile and a removable independent outer support for the tile after the removal of the outer mold.

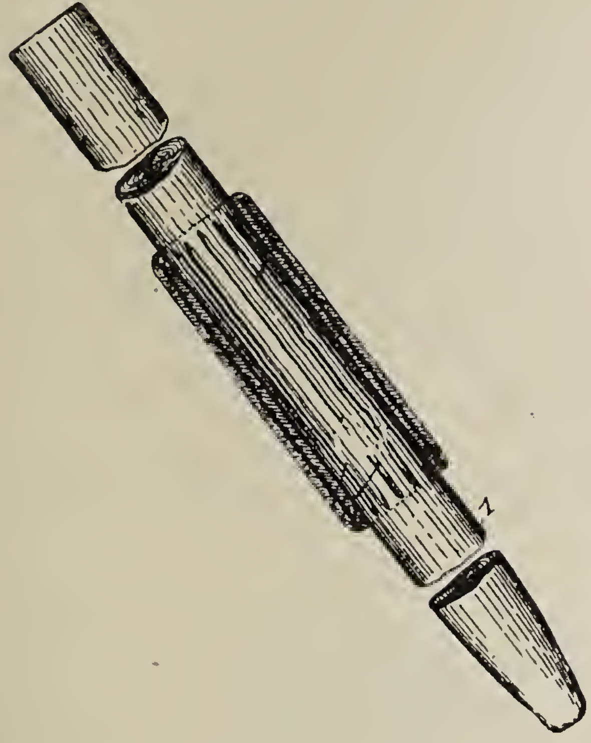
819,299. Concrete Mixer. John Miller, Minneapolis, Minn., assignor to Winner Block Machine Company, a corporation of Minnesota. Filed May 18, 1905. Serial No. 260,946.



Claim.—1. The combination with a mixing trough, of a shaft extending longitudinally through the same, said shaft having radial blades located in longitudinal rows and provided at their free ends with obliquely set blades, the blades of the one row being given an inclination in opposite direction from that of the adjacent row and the extreme end members of said blades being set at a backward inclination with respect to their direction of travel and having their outer edges extended radially and working close to the respective adjacent heads of said trough, substantially as described.

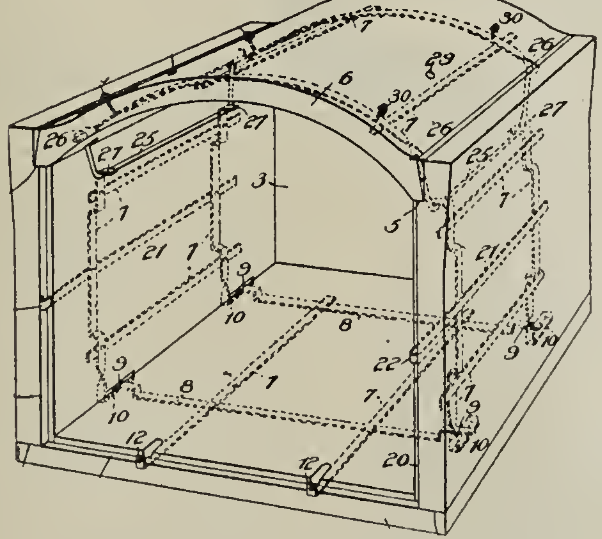
2. The combination with a mixing trough, journaled for com.

819,282. Means for Protecting Piles. Andrew M. Hunt, Berkley, Cal. Filed Aug. 16, 1904. Serial No. 220,948.



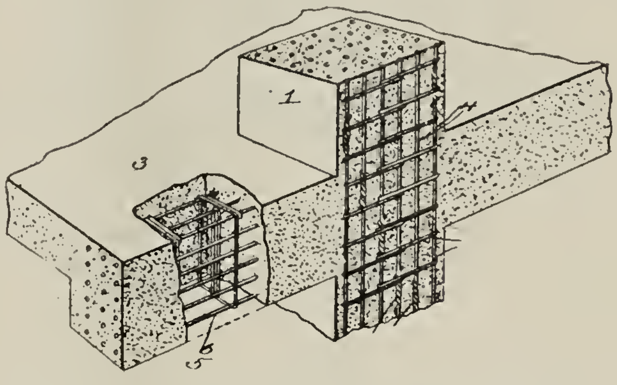
Claim 1.—The means of protecting wooden piles to render the same proof against the action of marine worms, bugs, insects or animals, which consists in inclosing the section of the pile to be protected within an outer casing of cement, mortar or concrete composed of magnesium oxid and an inert filler impregnated with magnesium chlorid.

821,185. Cement Burial-Vault. Geo. B. Okey, Indianapolis, Ind., assignor to Acme Burial Vault Company, Indianapolis, Ind., a corporation of Indiana. Filed Sept. 7, 1905. Serial No. 277,417.



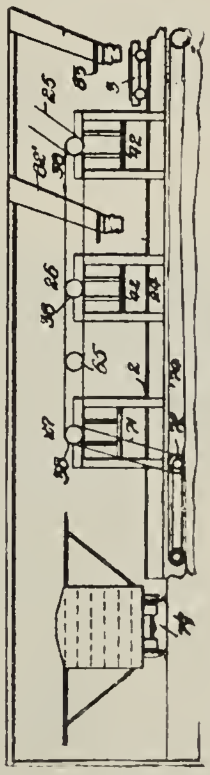
Claim.— 1. In a sectional burial vault, a bottom of sections, an embedded frame in each section, each frame having a pair of arms each terminating in uncovered angle ends at the joining of said sections, said frame having also a pair of arms projecting at the opposite side edges and terminating in straight uncovered ends, side sections each having an embedded frame, each frame having a pair of vertical arms terminating in angle ends in recesses at the lower edges of said sides, the side projecting arms of the bottom frames freely engaging the said angle ends within said side recesses to lock the sides to the bottom, and means for securing the angle ends of said bottom frames together.

821,569. Armored Cement. Pierre Zucco, Baltimore, Md. Filed June 28, 1905. Serial No. 267,473.



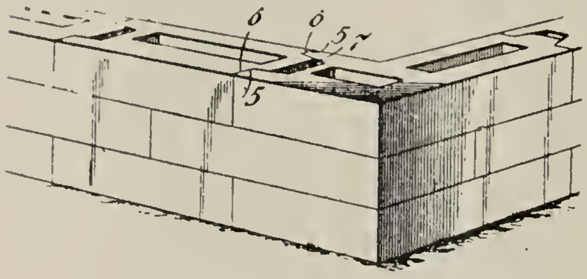
In an invention of the class described, a series of rods formed by a number of short bars, crocket connections between the bars, the connections being staggered, a series of binders or stirrups arranged alternately with respect to their free ends at regular intervals apart throughout the length of the rods, the said binders or stirrups consisting of a bar bent to form a rectangle within a rectangle, and cement or concrete incasing the entire structure, substantially as specified.

822,013. Apparatus for Forming Artificial Stone Building Blocks from Concrete. Albert A. Pauly, Youngstown, Ohio. Filed Jan. 22, 1906. Serial No. 297,167.



Claim.—1. In an apparatus, the combination of a trackway, a plurality of presses erected above said trackway, a car adapted to travel upon said trackway beneath said presses, a molding-frame carried by said car and comprising hinged gates, detachable dies carried by said presses, a polishing device mounted between said presses above said trackway, said polishing device consisting of a plurality of rotary polishers, an endless conveyer mounted adjacent to said presses, means to vertically reciprocate said dies, means to revolve said polishers, and means to simultaneously operate said conveyer, substantially as described.

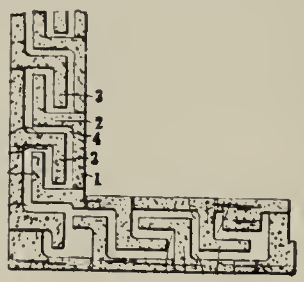
822,078. Cement Building-Block. George W. Roberts, Ravenna, Nebr. Filed May 10, 1905. Serial No. 259,798.



Claim 1. A building-block comprising a body formed with a central vertically arranged opening, one end of the body being formed with a dove-tailed groove extending vertically thereof and of greater width at its inner end than the width of said opening, the opposite end of the body being provided with a wedge-shaped rib of less length than the depth of the groove, the dove-tailed groove and rib being of greater extent transverse the bliock than the similar dimension of the vertically arranged opening, whereby to provide the maximum air space at the ends of the block.

822,320. Building-Block and Wall Constructed Therefrom. Augustus O. Thomas, Kearney, Nebr. Filed Jan. 7, 1905. Serial No. 240,124.

Claim.—1. A wall for building construction composed of independent blocks laid in succeeding courses and having solid front and rear parallel faces, the said blocks having portions extending transversely inwardly from the faces and binding with the block of the preceding and succeeding courses, but not contacting with the block forming the opposite face and in the same course.



NEWS NOTES.

Prospectors are looking for Portland cement raw material at Spokane and Seattle, Wash.

Pontiac, Ill., will construct five miles of cement walks under city ordinances just passed.

The White Cliffs Portland Cement Co. is not running, having been closed down for some time.

Machinery is being delivered at the new Lehigh Portland Cement plant under way at Fogelsville, Pa.

"Ireland for the Irish" is the motto of the Athlone Urban council, where, at a recent meeting, Irish cement was ordered to be used in lieu of the English brand.

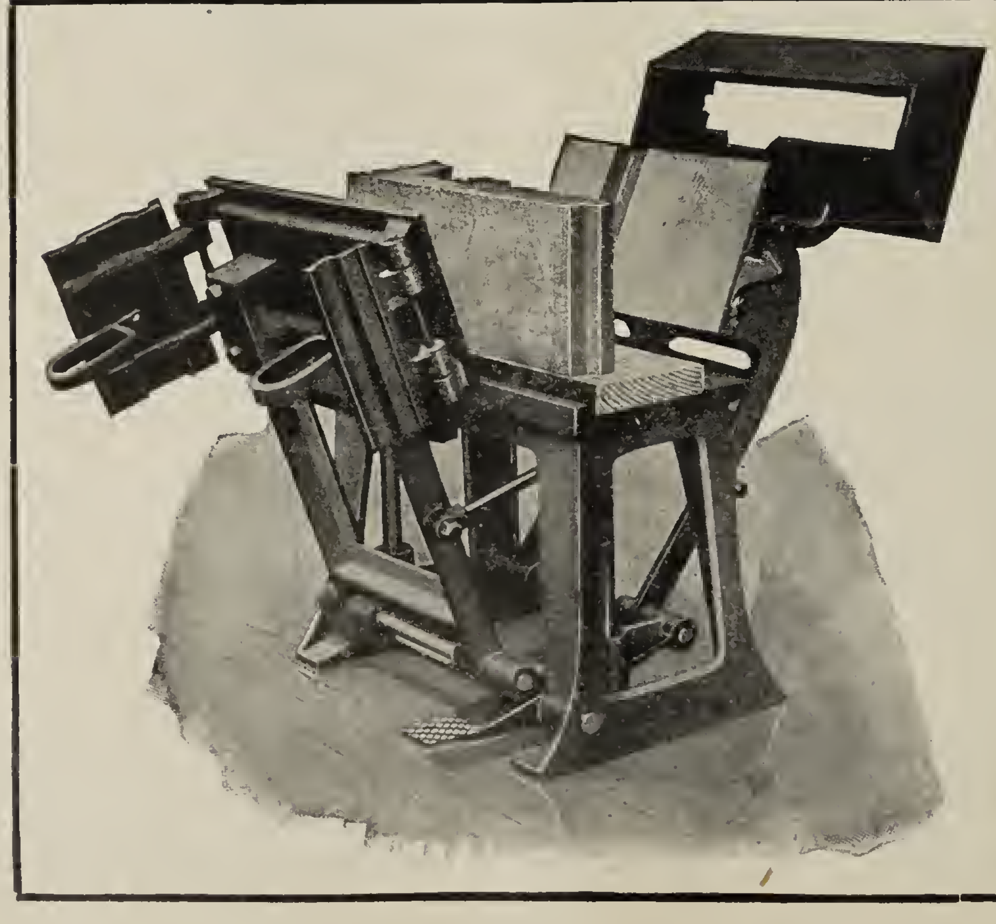
The Iroquois Portland Cement Co. of Caledonia, N. Y., will double its capacity, the present capacity being 500 barrels per day. A contract with the Niagara Power Co. to supply 600 horsepower has been closed. A transformer station will be installed to step down electric power from 60,000 to 225 volts. The general offices of the company have been removed from Buffalo to Caledonia.

Wm. Haughey, 18 years old, employed at the Iola Portland Cement Works, picked up a dynamite cap near the works and placed the same in his pocket, where it accidentally exploded, lacerating his hand and hip. Recovery doubtful.

James P. Wood, vice-president and treasurer of the Buffalo Cement Co., Buffalo, N. Y., died June 7th, after an operation on the stomach had been performed. Mr. Wood was 45 years of age at his death.

U. S. Consul Johnson of Puerto Cortes states that cement is now made in Honduras, and that the duty on the imported article is practically prohibitory. A barrel of cement of 400 pounds, in addition to the duty of 2 cents local currency per pound, pays charges of $3.40, making a total of $11.40, which is equivalent to $5.01 United States currency.

The Lake Superior Cement Company, a concern that proposes to manufacture and deal in cement, has filed its articles of incorporation with the register of deeds. The incorporators are Alva L. Merritt, J. W. Merritt and L. C. Merritt, all of Duluth. The company is capitalized at $300,000, of which $150,000 represents preferred stock and the remainder the common stock.



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Thus, the Miracle Pressed Stone Co., of Minneapolis, find that it pays them to advertise not only their machinery in trade papers and the like, but it pays them to advertise the block in the leading magazines of the country. They have recently entered this field and find the results so pleasing that they will increase their appropriation in this particular as fast as the "members of the Miracle family" can supply the increasing demand.

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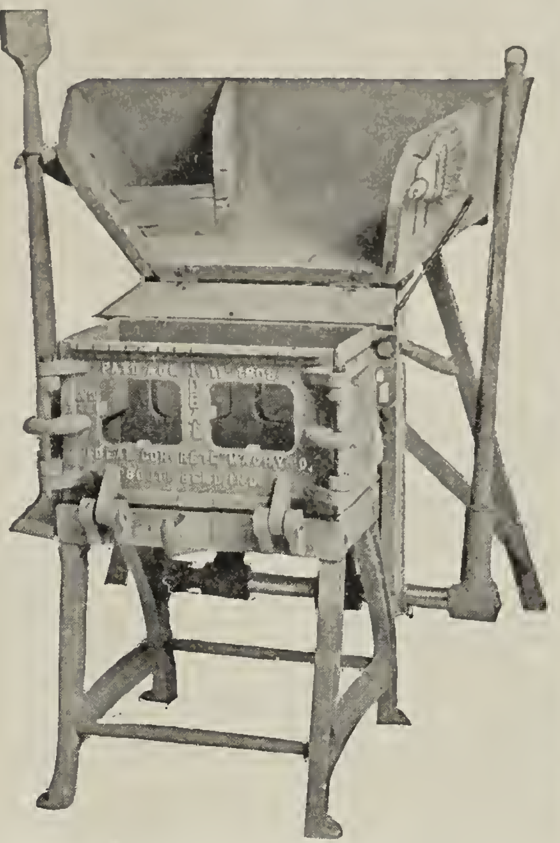

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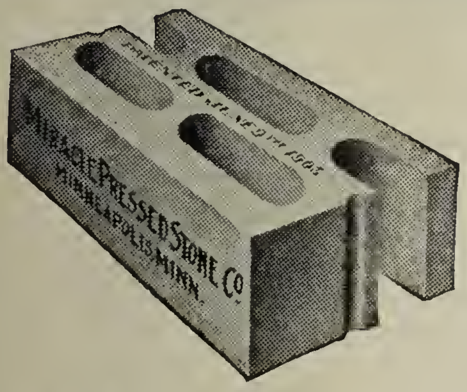

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A Chemist for portland cement plant in Spanish America. Mail full statement of particulars of past experience and references to

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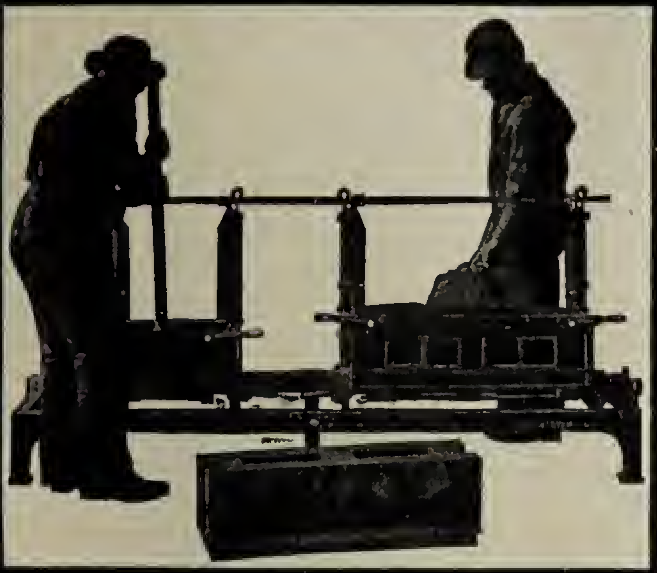

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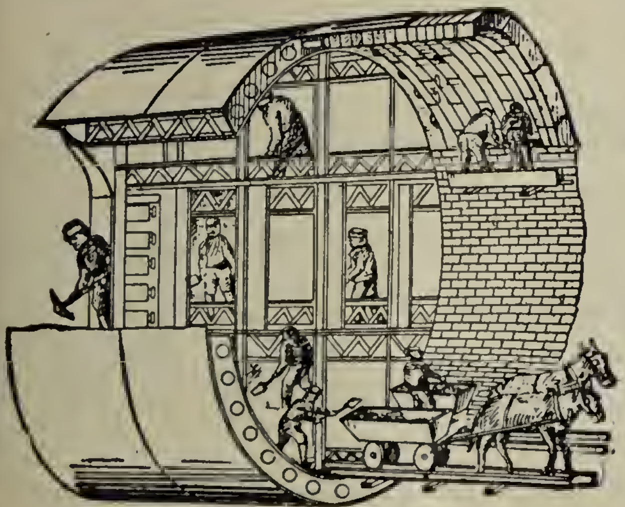

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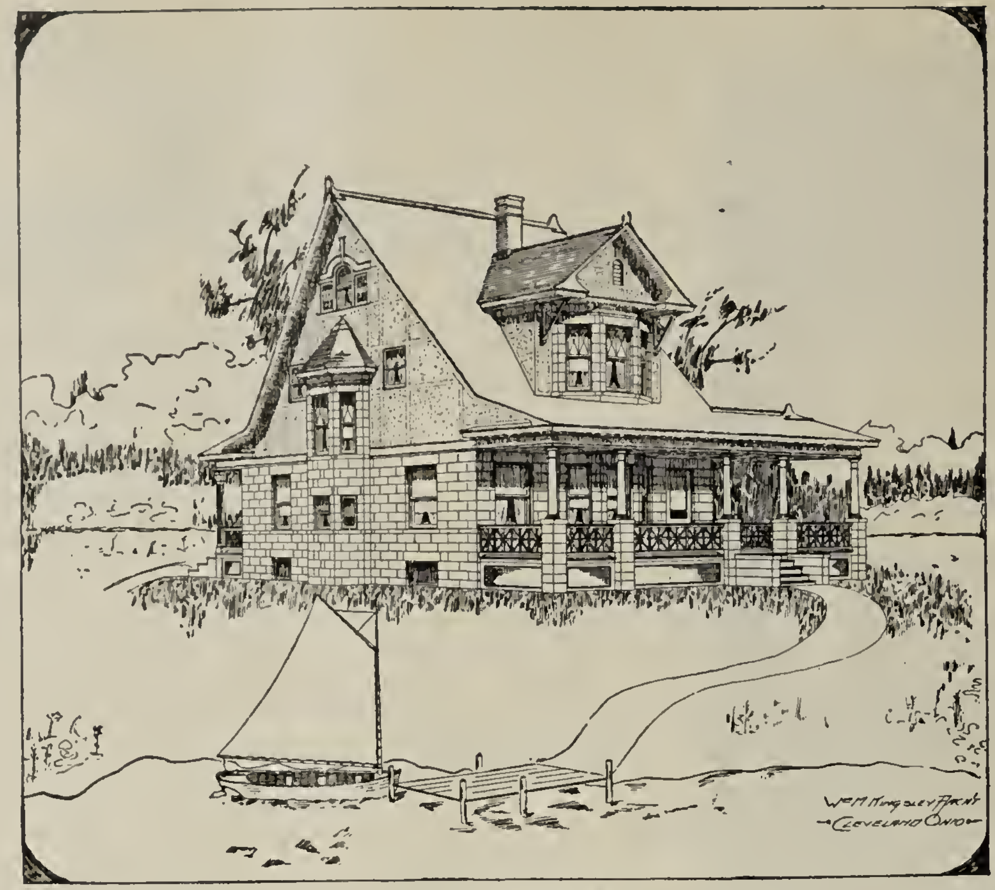

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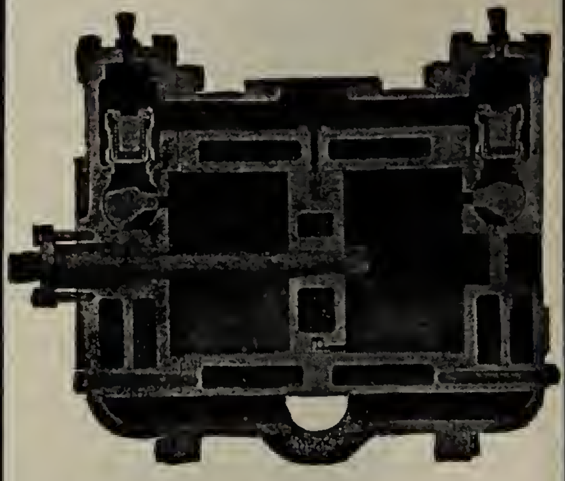

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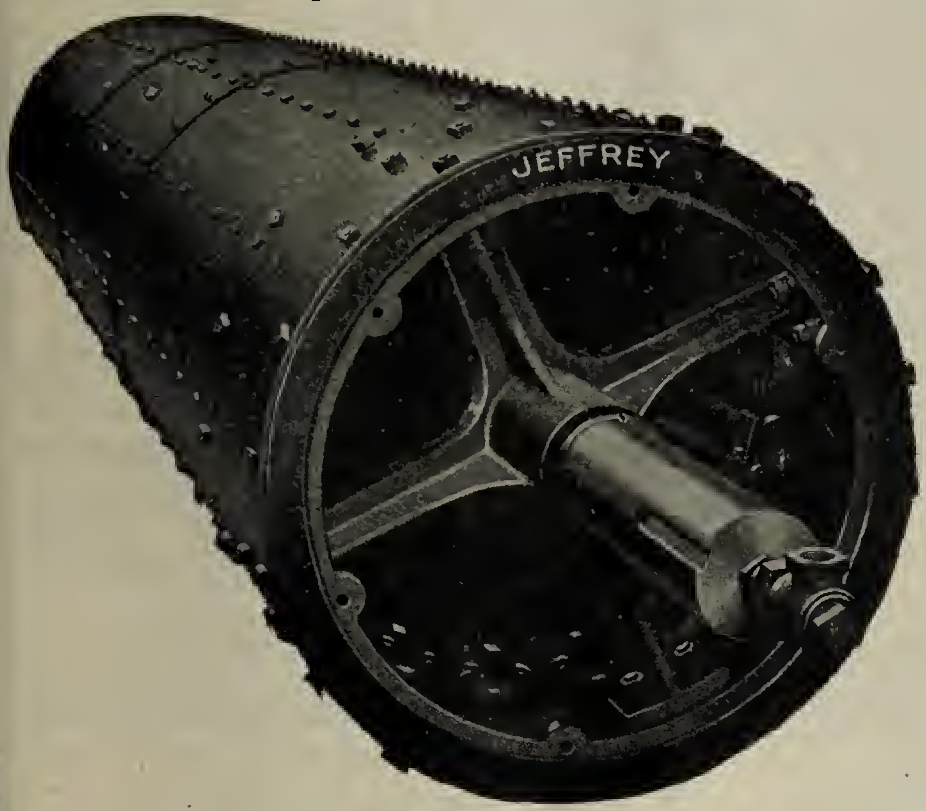

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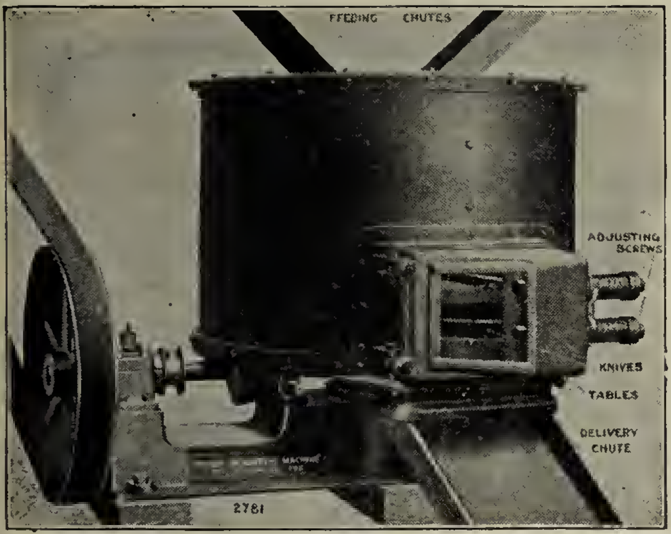

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A Monthly Journal of Practically Applied and Analytical Chemistry, Edited by Richard K. Meade.

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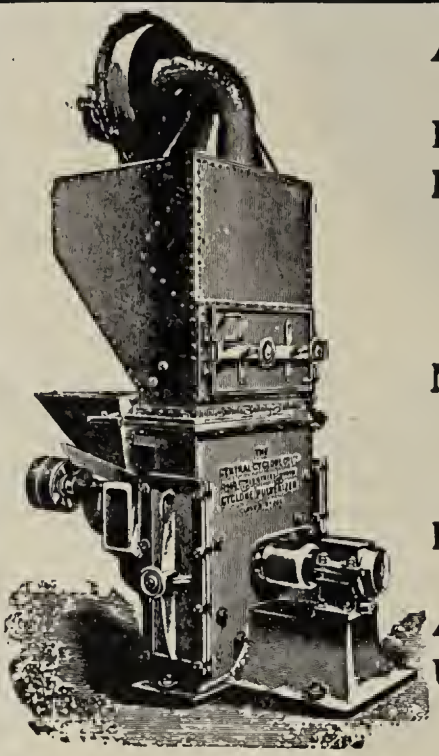

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CEMENT FACTORY

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General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.

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for handling Cement, Cement Clinkers, Crushed Stone, Clay, etc.

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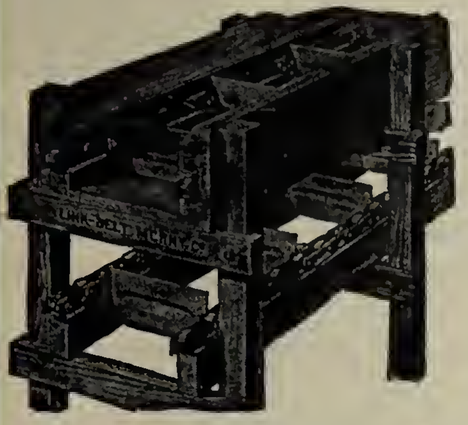

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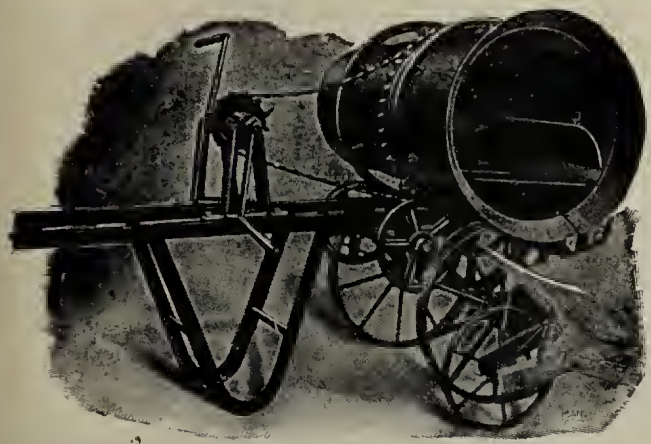

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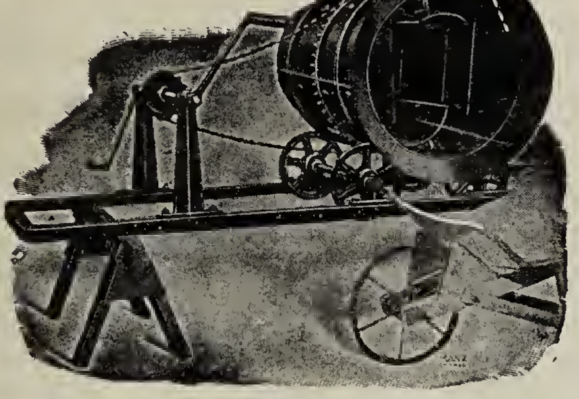

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We are taking orders for Tampico Fibre Brushes used in making the brush finished concrete. This finish resembles the finest cut stone work. Brushes delivered by mail at $1.00 each. Address CEMENT AND ENGINEERING NEWS, 22 Fifth Avenue, Chicago.

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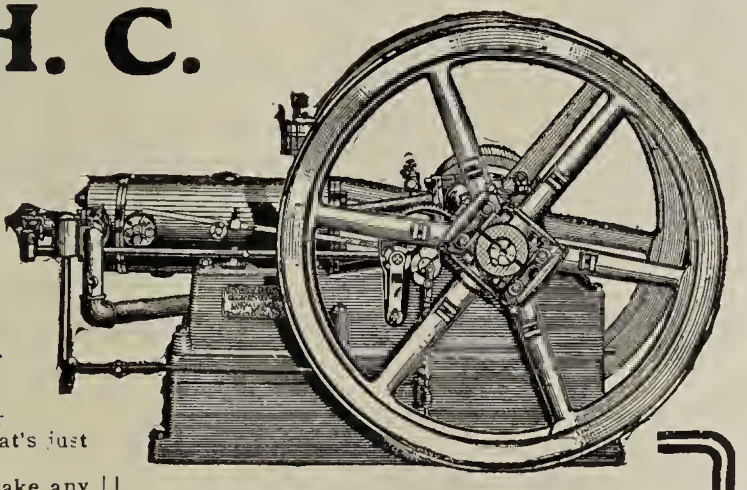
GASOLINE ENGINE

ON THE WORK



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The power is too important a matter to take any chances with.

Suppose you are entering upon cement work—that boundless new field.

In almost any of the hundred forms of cement work coming into use, you'll want a power.

Take the running of cement and concrete mixers. Nothing could be better suited to your wants than an I. H. C. Gasoline Engine.

You must have and you get in an I. H. C. Engine—
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Best of all, you don't have to be a machinist to operate it—anybody of just ordinary judgment by using just ordinary care can get the same service from it that an expert can.

A power of wide adaptability—the contractor's own.

You will want just that kind of an engine if you are
—Operating hoisting machinery
—Making cement blocks
—Doing bridge work
—On railroad cut and tunnel work
—On general construction work

You don't need to consider for a moment whether an I. H. C. Engine is adapted to your needs. That is beyond all question.

It is made in horizontal style—Portable and Stationary—4, 6, 8, 10, 12 and 15 horse power. Vertical in 2, 3, 4 and 5 horse power.

The duty, the long life, the certainty to work, the economy, the ease of operation—these are things you want to consider when you buy a power.

No man in general contracting lines can inquire fully into an I. H. C. Engine without being convinced that it will fill the bill for him.

Call on an International local agent and see it or write the home office for catalogue.

INTERNATIONAL HARVESTER COMPANY OF AMERICA, CHICAGO, ILL.
(INCORPORATED)

Technical Information

Relating to Waterproofing Compound for Portland Cement Products. Prevention of efflorescence and general improvement of Portland Cement Concrete.

For information address, Box K, care Cement and Engineering News, 226 La Salle St., Chicago, Ill.

DENSITOR For Waterproofing Concrete FILLS THE VOIDS

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,

228 La Salle St., CHICAGO, ILL.

10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.

Write for Catalogue D. Washington, D. C.

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July, November
December

1897
January, May
February, June
March, July
April, September

1898 . . . . June

1899
January, July
February, October
March

1902
August, September

1904
January, February

WE PAY 25 CENTS EACH FOR ABOVE BACK NUMBERS

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Fire Brick Linings
For Cement Kilns

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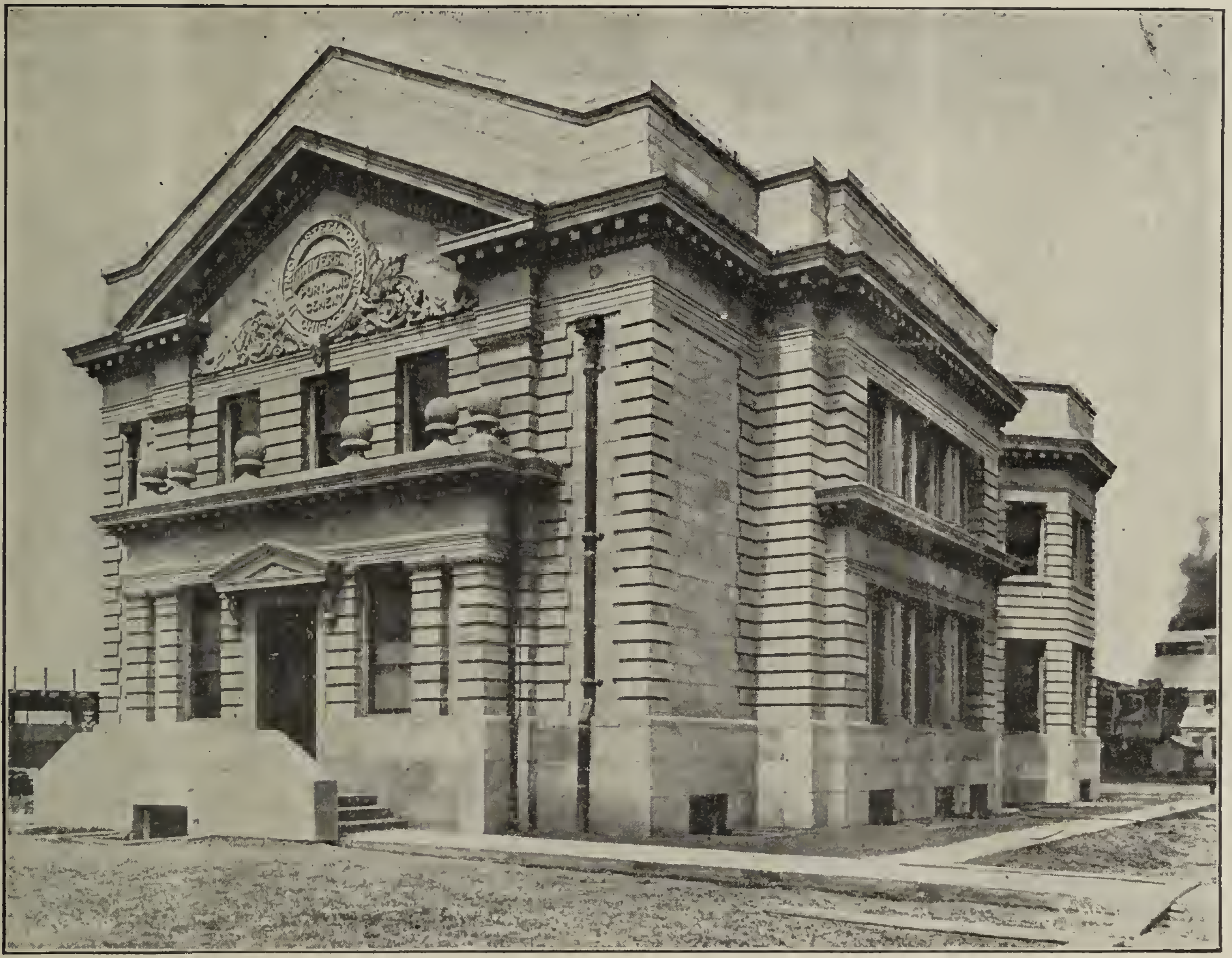

OFFICES AND LABORATORY OF THE ILLINOIS STEEL COMPANY'S CEMENT DEPARTMENT, BUFFINGTON, INDIANA. CONSTRUCTED OF LITHOLITE (CEMENT) CAST STONE. STEVENS' PROCESS.

CEMENT AND ENGINEERING NEWS
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher
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Cable Address—"Seafert," Chicago.

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"This world belongs to the energetic"

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, JULY, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

GROWTH OF THE CEMENT INDUSTRY.

The American Portland cement industry has made extraordinary strides during the past 15 years, the output in 1890 being 67,000 tons against 6,665,304 tons in 1905. The output in 1906 has been estimated at forty million barrels, or eight million tons. At the present rate of increased production we will soon be manufacturing 60,000,000 barrels per year.

This increase is definitely shown by the orders for cement machinery on the books of one manufacturing concern alone, which has booked orders for cement machinery that will be capable of producing 4,000,000 barrels of cement in 12 months. Considering that all of the cement machinery supply houses are full of orders, the increased production for 1907 will be nearly or quite 10,000,000 barrels.

The United States is now the largest producer of cement in the world, and likewise the largest consumer. We still import foreign brands to the value of $1,079,958 during the last eleven months ending May 30, 1906, of which only $14,867 remained in bonded warehouses on May 30, 1906. There has been no decrease in production for the past 15 years. The average yearly increase during this period has been 35¾ per cent; the highest yearly increase was 74 per cent. in 1897, while the lowest was 4 per cent in 1893. The great bulk of cement heretofore used has been for monolithic constructions. We are now entering upon a new era, namely, reinforced concrete construction, which present great possibilities, as shown by the work done in Europe by the Hemebigre Company. This company during the past ten years has erected reinforced concrete constructions valued at $100,000,000 in Europe. This is an indication or a forerunner of what will be accomplished here, when people are educated up to reinforced concrete. One of the healthiest signs in this line is that large Jewish manufacturing concerns are adopting reinforced concrete for their factory buildings, several of which are now going up in Chicago. Even with the present high prices of cement, reinforced concrete structures can be erected at from 25 to 30 per cent less than structural steel buildings. And thus the good work flourishes, and grows. "Printers' Ink," a technical advertising journal, says reinforced concrete needs a thorough advertising campaign to bring it prominently before the public and thus extend its use a hundred fold.

CONCRETE BLOCK MACHINE MANUFACTURERS' ASSOCIATION MEETING.

The above named association will hold its second annual meeting at Detroit, Mich., August 8th and 9th. The following program has been arranged:

PROGRAM.

WEDNESDAY, AUGUST 8.

9 A. M. TO 10:30 A. M.

Arrival and registering of machine manufacturers and guests, 11 a. m.

Meeting called to order by president.

Secretary's report.

Reports of committees.

Reading of special communications.

Adjournment for lunch.

WEDNESDAY AFTERNOON 1:30.

Reading extended invitations.

Sales of Concrete Block Machines, the Uses of its Product, and the Industry in General, O. U. Miracle, Miracle Pressed Stone Co., Minneapolis, Minn.

Freight Classifications for Concrete Machinery, J. F. Angell, Winget Concrete Machine Co., Columbus, Ohio.

Concrete Block Insurance, Sid L. Wiltse, Cement Machinery Co., Jackson, Mich.

Specifications for Concrete Blocks and Brick, Frank L. Kykema, The Dykema Company, Grand Rapids, Mich.

Special Demonstration of Madusa Compound, R. R. Fish, Sandusky Portland Cement Co., Sandusky, O.

What the Government is Doing for Concrete Blocks, Richard L. Humphrey, Engineer and President N. C. U. A., Philadelphia, Pa.

WEDNESDAY EVENING 8

Banquet at the Wayne hotel and adjournment to Electric Park.

THURSDAY MORNING 9.

Foreign trade, M. Wetstein, Ideal Concrete Machinery Co., South Bend, Ind.

Concrete Block Architecture, A. T. Bradley, Century Cement Machine Co., Rochester, N. Y.

Ornamental Products, E. G. Harter, Cement Working Machinery Co., Detroit, Mich.

Advertising, S. J. Young, P. B. Miles Mfg. Co., Jackson, Mich.

Cast Stone, C. W. Stevens, Harvey, Ill.

Coloring of Concrete Products, J. P. Sherer, Nat. Bldg. Block Co., Milwaukee, Wis.

Adjournment for lunch.

THURSDAY AFTERNOON 1:30.

Concrete Blocks and Brick from an Insurance Inspector's View, W. G. Sanderson, Inspector and member Committee for Building Construction of National Fire Protection Association, Chicago, Ill.

Out West, J. W. Sanderson, Cement Machinery Mfg. Co., Burlington, Ia.

Trade Journal Advertising and General Publicity. Open to short talks by various representatives present.

The Industry, W. J. Scott, American Hydraulic Stone Co., Denver, Colo.

Plastering and Lathing to Cement blocks, John G. Miller, Winner Block Machine Co., Minneapolis, Minn.

Great and Universal Use of Concrete Blocks and Brick. Discussed by all members present.

Election of officers.

Adjournment—"Till We Meet again."

ATLAS PORTLAND CEMENT CO. STAFF AT HANNIBAL.

W. A. Smith, western manager; George A. Mahan, attorney; D. B. Pierson, traffic manager; W. H. Weitknecht, assistant superintendent; T. B. Cornell, mill accountant; C. A. Chisholm, superintendent construction; J. T. Hall, chief engineer; F. U. Smith, chief millwright; C. A. Norton, general foreman; A. L. Fry, general foreman; Ray Rucker, mining engineer.

LABOR UNIONS AND POLITICS.

To check the political ambitions of the Labor Union leaders, the National Citizens' Industrial Association is submitting to political candidates throughout the country two questions:

"Have you pledged your support to the Labor trust or to any other trust, organization, or corporation seeking special legislation?

"Will you or will you not represent the citizens as a whole and seek to protect them from class legislation, whether by organized capital or organized labor when such legislation is in the interests of the few to give power over the many?"

CEMENT IN SAN FRANCISCO.

One of the large contracting firms of San Francisco has placed an order for 1,000 barrels of cement per day for delivery in August. The demand is gradually increasing day by day, and before the close of the year the demand in San Francisco will reach from 10,000 to 15,000 barrels per day. Bricklayers are now demanding $14 per day, and carpenters $7 per day. These wages are being paid, with a scarcity of skilled labor even at these prices.

Ithaca Concrete Machinery Co. of South Bend, Ind., has established a factory and office in Canada for the manufacture and sale of its concrete block machinery at 124 York street, London, Ontario, from which point all orders for its machinery in the Dominion of Canada will be supplied. So many orders were pouring in from Canada that the company felt justified in opening a branch factory in that country. The Canadian branch is in charge of Mr. F. M. Leach. The factory is in operation, and shipments are being made in the regular order of business. The South Bend factory is overrun with orders to supply the home and foreign demand.

A second Portland cement plant has been projected at Mason City, Iowa. The promoters of the new company are George E. Nicholson of Iola, Kansas, who is president of the Kansas Portland Cement Mill and also president and general manager of the Indian Portland Cement mill at Neodesha, Kansas. S. L. Avery, president of the United States Gypsum Co. of Cleveland, Ohio, and Chicago; A. B. Cockerill, president and general manager of the Cockerill Smelter Co., of Altoona, Kansas; and J. C. Burch, secretary of the United States Gypsum Co. of Chicago and Cleveland, are interested. The proposed mill will contain ten rotary kilns each 8 feet by 110 feet long.

The capital is to be $1,200,000 preferred stock and $1,800,000 common stock. The company guarantees to erect a plant having a daily output of 2,500 barrels. The company has purchased 320 acres of land carrying limestone and shale. The mill is to cost $1,000,000.

An explosion in the coal grind mill room of the Union Portland Cement Co., at Rushsylvania, Ohio, on the night of July 8, caused the death of John Scott, superintendent of the plant, and an unknown man, who had just entered the plant in search of work. M. D. Thomas was badly burned. The damage to the plant is estimated at $10,000.

BIRMINGHAM CEMENT BLOCK MANUFACTURING CO.

One of the largest cement building block factories in the South is located at Birmingham, Ala. This company now has 35,000 finished and cured blocks in stock, it has the confidence of the architects in the surrounding country, and consequently does a large business. The architects and the company are working together. This confidence has been built up by turning out strictly first class work, and making frequent tests for architects and builders of their product.

The company has the contract for a new fire station and other large contracts. The factory is now turning out 800 blocks per day. The curing of the blocks is given careful attention. They are kept moist by an overhead system of pipes in the curing room. The company likewise manufactures concrete columns, window caps, slabs and arches.

The ordinances of the city of Birmingham require that all concrete blocks must be cured at least 21 days before laying in the wall. Ornamental pieces after architect's drawings are produced when ordered. W. G. Oliver is president of the company, J. H. Hillman vice-president; W. A. Watts, secretary and treasurer. Mr. Frank A. Evans, late of Detroit, is the expert concrete man in charge of the plant.

The city of Jalapa, Mexico, is built of stone and cement, the other Mexican cities of Mexico are likewise large consumers of cement, which enters into the construction of most of the permanent buildings of the country. New York capitalists are considering a project for establishing several large cement plants in Mexico. They believe the outlook for the industry in the republic is very bright and cannot see how several large plants can fail to be profitable, especially in view of the fact that the heavy consumption of the American government necessitated by the construction of the Panama canal and irrigation works in various parts of the country will practically wipe out the surplus production in the United States, a large portion of which is now marketed in Mexico.

COMPARISON OF COST OF CONCRETE AND STONE MASONRY.

The cost of concrete and stone masonry varies largely with the local conditions and the character of the work on which they are used; but there are very few places where concrete masonry is not only cheaper than stone masonry, but better, being much stronger and more suitable in many ways. This fact is becoming more generally recognized, and more than one quarry which in former years produced building stone is now producing crushed stone for concrete. The following figures give a general idea of the comparative cost of brick masonry and concrete, per cubic yard:

BRICK.

500 brick	$3.75
¾ barrel cement	1.50
¼ load sand	.50
Labor	.25
Making a total	$8.00

CONCRETE.

1 barrel Alpha cement	$2.00
¼ load sand	.50
Broken stone	1.50
Labor and forms	1.50
Making a total	$5.50

—Scientific American.

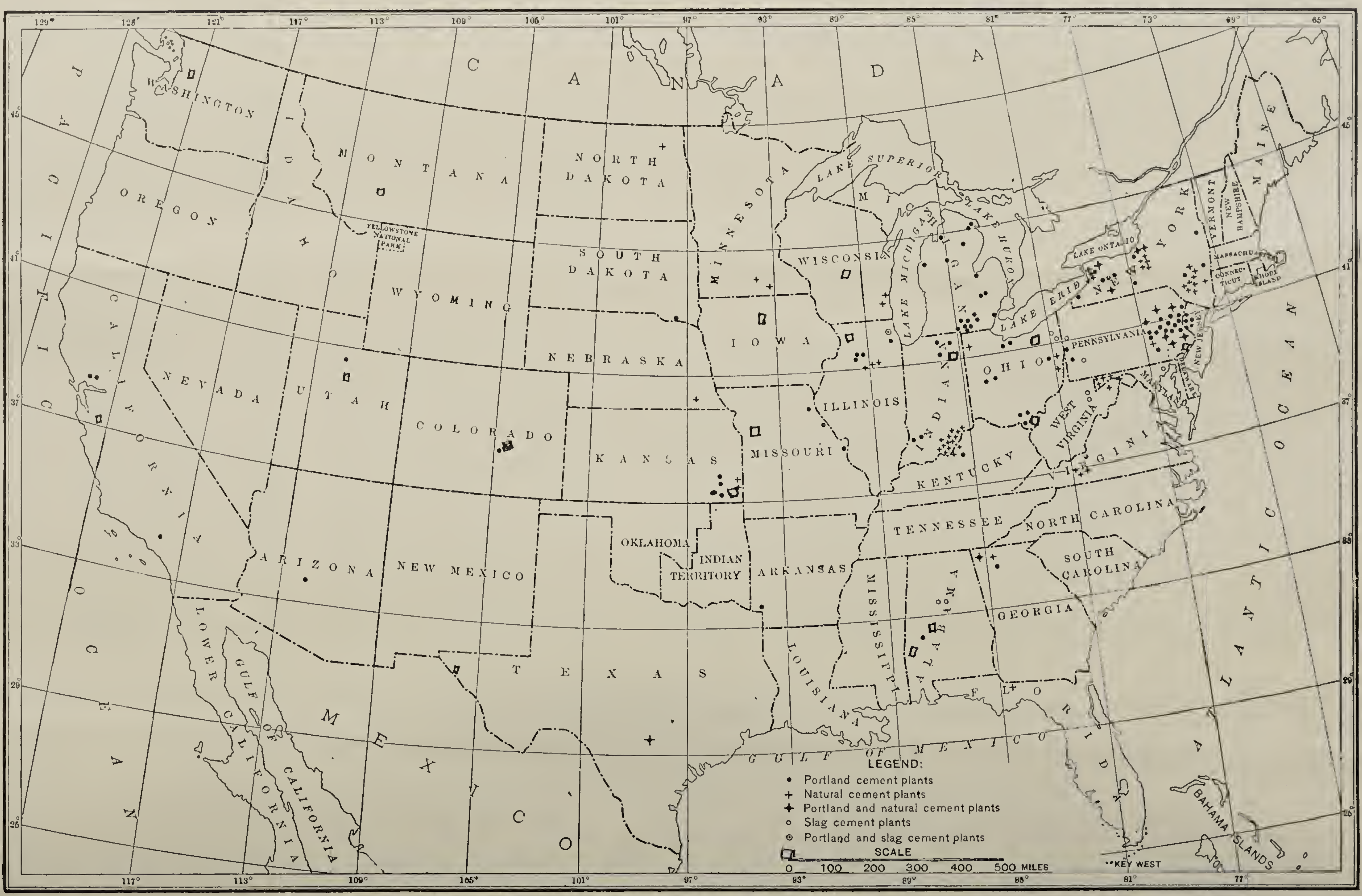
New Hamburg Keene Cement and Lime Company, New Hamburg, Dutchess county, N. Y.; capital, H. G. Posson and M. N. Butler, New $500,000. Directors: T. J. Flynn, York.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	MAY				ELEVEN MONTHS ENDING MAY			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	....	....	6,641,600	$19,553	6,997,424	$ 22,910	21,851,580	$ 66,483
Belgium..........	9,924,649	$ 28,066	9,091,009	25,808	149,526,701	482,929	119,245,121	373,948
France............	1,190,600	4,083	2,425,700	8,724	7,454,199	28,366	8,345,376	30,447
Germany..........	6,158,543	20,354	33,571,428	122,232	183,226,141	619,635	191,517,047	650,716
All Other Europe.	....	....	7,936	21	1,127,501	4,224	8,332	22
British North Am.	62,600	356	1,287,650	8,553	215,515	1,405	1,339,200	8,844
Other Countries..	245,060	930	7,546,700	29,748	2,116,324	8,096	9,809,855	38,769
TOTAL..........	17,581,452	$53,789	60,572,023	214,619	350,763,805	$1,167,565	352,116,511	$1,169,529
Domestic Exports of Cement, bbls.	113,812	$148,977	55,886	$83,846	957,570	$1,338,237	756,640	$1,079,958

There were 10,697,148 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in May 1905, valued at $34,474, against 4,857,438 lbs. in May 1906, valued at $14,867.

For 11 months ending in May 1905, there were 110,009 tons of asphalten imported in the United States, valued at $496,997 against 70,134, tons imported in 11 months ending May 1906, valued at $303,838.



LOCATION OF CEMENT PLANTS.

THE SMALL SQUARES REPRESENT PLANTS THAT HAVE NEWLY COME INTO OPERATION OR UNDER CONSTRUCTION.

THE NECESSITY OF PRECAUTIONS REGARDING REINFORCED CONCRETE.*

Hitherto architects and engineers who devote themselves to reinforced construction appear to be so confident of the strength and stability of this new structural material under all conditions that they fail to give reasonable attention to the fire-resisting qualities of the materials they use, being quite content to declare that steel rods embedded in concrete must be more fire-resisting than any other combination of materials.

Published examples of the action of reinforced concrete under actual fire fail to give definite particulars with regard to the diameter of the reinforcing rods, the composition of the concrete used, and its thickness in front of metal members. Information as to the nature of the fire and its extent, where extinguishing appliances are brought to bear, with the power of these appliances and water supply available, are also usually of the vaguest description or altogether absent.

Any photographs submitted by interested parties illustrating the effect of the fire will doubtless be taken from points of view most favorable to the object the photographer desires to serve. Sometimes such photographs do not even illustrate the portions of the building affected by fire, but only parts damaged from some other cause, such as explosion or shock, having no bearing whatever on questions of fire-resistance.

Experts in reinforced concrete buildings agree that to obtain the best results (considered only from a structural point of view and under normal conditions) reinforcing rods must be placed near the outer surface of the concrete, a thickness of 1 inch in front of the rods being generally adopted; but this thickness is altogether insufficient for the protection of metal rods against a serious fire, and the aggregates, sand and cement, for the concrete used to protect the metal rods are of the greatest importance.

It has been conclusively proved that concrete having gravel aggregates is especially unreliable under the action of fire, and the same may be said of other dense material. Aggregates that have passed through fire and are of a porous nature, such as broken stock brick, clinkers, clean coke-breeze with fine ground high-class Portland cement and sand, offer the greatest resistance to fire; but even with these materials a thickness of at least 2 inches in front of all important metal members is essential for reasonable security.

There would be no difficulty in applying a thickness of 2 inches of concrete of this description for the protection of all metal work, while the central portion of the concrete might be of different material.

It is to be feared that some of the large buildings already erected with reinforced concrete will fail when subjected to a serious fire amongst their inflammable contents, especially in cases where the building chiefly consists of extensive galleries round large central vertical spaces passing through all floors; such buildings certainly involve the possibility of very serious consequences, as proved in numerous instances, and even reinforced concrete construction can do but little to lessen this evil. The Horne Building, Pittsburg, is a case in point.

The method adopted for protecting columns and other parts of reinforced concrete structures against mechanical injury during the making and deposit of merchandise is of the greatest importance. With this object, in many large public warehouses constructed in reinforced concrete; steel angles of considerable size and weight are partly embedded in the concrete flush with its outer face at each corner of numerous square columns supporting very heavy loads; these steel angles are held in place by riveted eyes passing into the concrete. In the event of a serious fire amongst merchandise stored around these columns these steel angles would twist, displacing portions of the concrete, leaving important reinforcing rods exposed at most critical moments. Any mechanical protection needed should be held in position independently of the concrete and be placed against its outer face only.

Divisional walls relied upon as fire-stops in warehouses and similar buildings should not be less than 9 inches thick.

In a fire test made in a reinforced concrete box on thick walls enclosing about 175 cubic feet moisture was freely driven through the sides of the box, two of which were 6 inches thick and two 4 inches thick. The evaporation of this moisture kept the outer side of the concrete cool, but on the passage of moisture ceasing, which it did at the end of the test of forty-five minutes' duration, the outer surface of the concrete became very hot.

Combustible goods against a reinforced concrete wall less than 9 inches thick would be liable to ignition by heat from a fire burning on the opposite side of the wall.

As you are all aware, the Fire-Prevention Committee's tests are conducted under the Universal Standards of 1903, which require for classification, as affording "full protection" against fire, a fire test of four hours' duration (attaining 1,800 degrees F.), followed by the application of water for five minutes from steam fire-engine to a floor measuring at least 200 feet super., loaded with at least 2½ cwt. per foot super.; whilst other classifications are obtainable, such as that of affording "partial protection" and "temporary protection" for lesser periods and under less stringent conditions.

NEWS NOTES.

W. J. Oliver & Co. of Knoxville, Tenn., are negotiating with the Chatanooga Chamber of Commerce for concessions for a cement plant to be located in the vicinity of Chattanooga.

The Janesville Cement Post Co. has contracted to furnish cement fence posts for the Chicago & Milwaukee Electric Railway Co., to be used on the company's right of way. Fifteen men now turn out 800 posts per day.

The Ohio State Board of Public Works has postponed the letting of a contract for 22,000 barrels of cement, claiming there is a cement trust, which has raised the price of cement. Prices have gone up simply because the demand exceeds the supply.

The new government Portland cement plant at the Roosevelt dam, in the Salt River valley, Arizona, erected to furnish cement to construct the dam, is to be removed to another location as soon as sufficient cement has been manufactured to supply the requirements of the dam.

The Benn's Building Company, of Dayton, Ohio, $50,000, was incorporated by M. S. Benn, William A. Hosters, W. S. McConnoughey, Sophie Meeks and S. Brumbaugh. The Benn's company has heretofore carried on business as a co-partnership engaged in building concrete houses. It will take no contract under $5,000. Its business has become so extensive as to require incorporating.

The Sandusky Portland Cement Co. is erecting a hotel building near its new plant at Dixon, Ill., of concrete blocks. It will have a frontage of 75 by 30 feet and a 30-foot wing, two stories throughout.

The Hecla Cement Co. has resumed. The plant has been converted from a marl to a rock plant. The company has been in litigation for the past three years, and was sold under a decree of the U. S. District Court for $525,000, the deed of sale covering 76 typewritten pages, and was filed for record at Bay City, Mich., July 19th. The works now employ 100 men.

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*A paper read by Mr. James Sheppard, A. I. E. E. (Chairman, International Fire Library, Member of Executive of British Fire Prevention Committee), at the Milan International Fire Congress, 1906.

A LOW COST CONCRETE CULVERT.

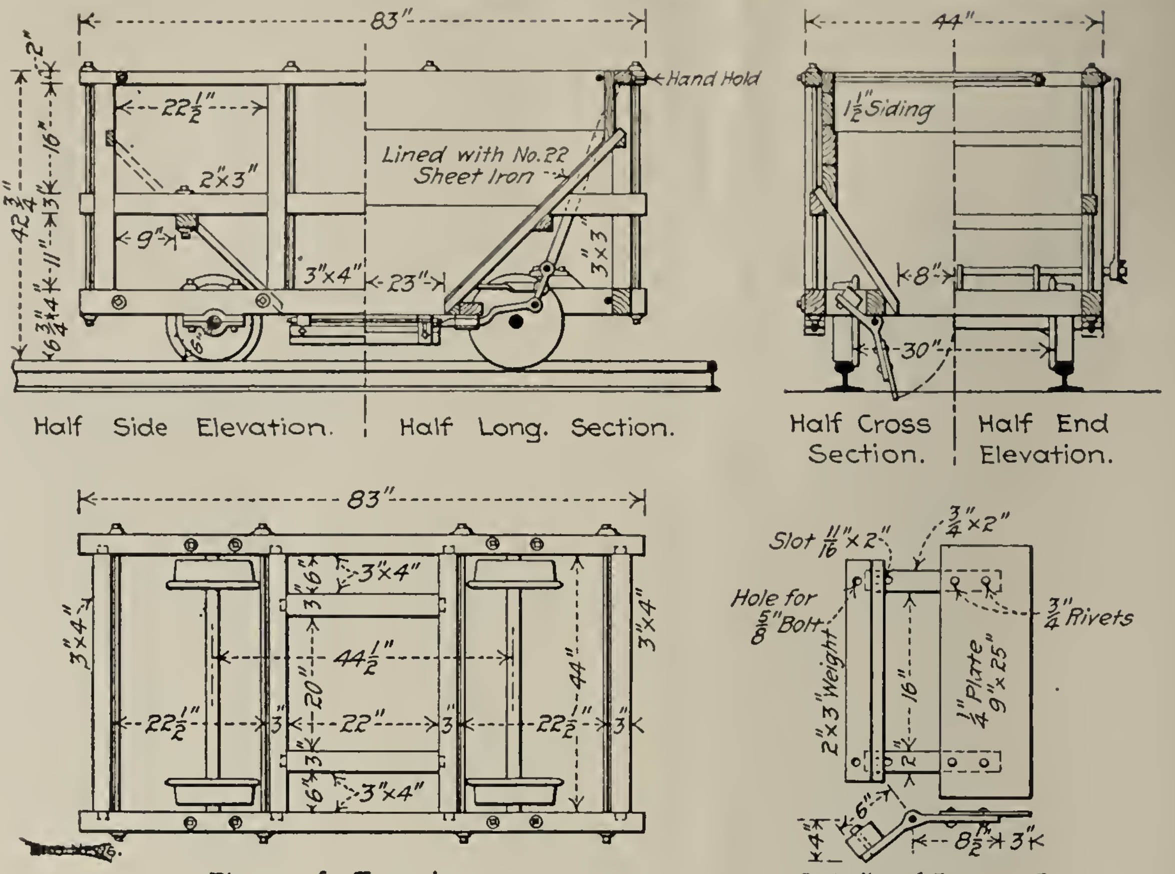
By W. H. Whorley.

*Principal Assistant Engineer; Nashville, Chattanooga & St. Louis Ry.

In line with the policy of the Nashville, Chattanooga and St. Louis railway to fill all trestles instead of rebuilding them, whenever possible to construct culverts for the waterway required, it was decided at the beginning of the present fiscal year to fill Trestle No. 55.7 on the Nashville division. This trestle, which is known locally as Yellow Bank Trestle, has a total length of 922 feet, with the track at an elevation of 76 feet above the valley. There is no stream under the trestle except during the wet season, when a large volume of water passes through the valley.

After making a survey of the drainage area above the trestle to determine the size of waterway required, a 12-foot full-centered concrete arch culvert with 6-feet side walls was decided upon as being ample, and plans were prepared for the same.

In designing the lay-out of the plant for building the culvert advantage was taken of the height of track above the valley, so that as nearly as possible all material moved by gravity from the cars in which it was shipped until finally placed in position in the wall. Slag and sand were shipped in drop-bottom cars and unloaded into bins constructed in the trestle. These bins were built with hopper bottoms ending in chutes that led to a wheeling platform, which occupied the space between two of the trestle bents and extended over a concrete mixer placed just outside the trestle. The slag bin was equipped with two chutes and the sand bin with one, so that all material for one batch could be loaded at the same time. A cement house was erected alongside the trestle at the wheeling platform, level with and adjoining the platform. An inclined chute led up from the opposite end of the cement house to an unloading platform at track level, so that the cement, which was shipped in sacks, could be handled directly from the cars to the chute, and thence by gravity into the house. The sand and slag were fed by gravity into wheelbarrows through gates controlled by levers to regulate the amount taken, and were then dumped into a hopper directly above the mixer. Two men wheeled slag to the mixer, one man wheeled sand, and one man wheeled cement. With the mixer in operation the wheeling platform became a busy place, as these men had to load the barrows and make a round trip, including dumping the load into the hopper, in about one minute's time. The maximum wheel-



A DROP-BOTTOM CAR FOR CONCRETE WORK, 1 CU. YD. CAPACITY.
Nashville, Chattanooga & St. Louis Ry.

TABLE I. STATEMENT OF COST OF CERTAIN CONCRETE STRUCTURES

	Name of Structnre				
	16 ft. Culv. No. 25.5, Nashville Division.	12 ft. Culv. No. 133.3, Chattanooga Division.	12 ft. Culv. Doe Creek, McMinnville Br.	10 ft. Culv. No. 1.0, P. & M. Division.	12 ft. Culv. No. 55.7, Nashville Division.
Labor Costs:					
Cubic yards	986	292	406	354	1,217
Excavation	$639.05	131.15	140.50	212.20	345.52
Unloading material	....	$54.00	65.15	63.70	139.81
Building forms	$407.70	136.80	295.20	217.80	665.91
Mixing and placing	$1.240.75	396.05	495.70	597.10	506.15
Back-filling and tearing down molds	$262.85	148.60	136.25	111.46	128.02
Not classified	$360.25	....	....	45.85	214.22
Totals:					
Labor	$2,910.60	866.60	1,132.80	1,248.10	1,999.63
Average per yard	$2.97	2.97	2.97	3.53	1.74
Material:					
Cement, Sacks	3,749	1,179	1,611	1,512	5,168
Value	$1,986.95	532.05	853.85	801.35	2,248.08
Sand, Cubic yards	468	134	188	158	576
Value	$140.40	53.60	75.20	63.20	172.80
Stone, Cubic yards	936	260	375	333	280
Value	$567.80	156.00	187.50	166.50	168.00
Slag, Cubic yards	....	....	....	....	945
Value	....	....	....	....	245 70
Lumber, Value	$543.35	125.00	121.50	167.05	362.62
Miscellaneous	$30.00	15.00	77.15	....	61.30
Totals;					
Material	$3,268.50	866.65	1,253.05	1,275.25	3,258.50
Average per yard	$3.30	2.96	3.09	3.60	2.63
Grand Total:					
Labor and Material	$6,179.10	1,733.25	2,385,85	2,523.35	5,258.13
Average per yard	$6.27	5 93	5.88	7.13	4.32

TABLE II. SHOWING COST OF CONCRETE WORK PROPER IN CERTAIN STRUCTURES.

	Namo of Structure				
	16 ft. Culv. No. 25.5, Nashville Division.	12 ft. Culv. No. 133.3, Chattanooga Division	12 ft. Culv. Doo Creck, McMinn-ville Br.	10 ft. Culv. No. 1.0, P & M. Division.	12 ft. Culv. No. 55.7. Nashville Division.
Labor Costs:					
Cubic yards	986	292	406	354	1,217
Unloading material, Cost	....	$54.00	65.15	63.70	139.81
Per yard	....	.18	.16	.18	.11
Building forms, Cost	$407.70	136.80	295.20	217.80	665.91
Per yard	.41	.47	.73	.61	.55
Mixing and placing, Cost	$1,240.75	396.05	495.70	597.10	506.15
Per yard	$1 26	1.85	1.22	1.69	.42
Total					
Labor	$1,648.45	586.85	856.05	878.60	1,311.87
Per yard	$1.67	2.00	2.11	2.48	1.08
Material Costs:					
Cement, Value	$1,986.95	532.06	853.85	801.35	2,248.08
Per yard	$2.02	1.82	2.10	2.26	1.85
Sand, Value	140.40	53.60	75.20	63.20	172 80
Per yard	$0.14	.18	.19	.18	.14
Stone or slag, Value	$567.80	156.00	187.50	166.50	413.70
Per yard	$0.58	.53	.46	.47	34
Lumber, Value	$543.35	125.00	121.50	166.05	362.62
Per yard	$0.55	43	.30	.47	.30
Total, material	$3,238.50	866.65	1,238.05	1,198.10	3,197 20
Per yard	$3.29	2.96	3.05	3.38	2.63
Grand total:					
Labor and material	$4,886.95	1.453.50	2,094.10	2,076.70	4,509.07
Average per yard	$4.96	4.97	5.16	5.86	3.71

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*A paper presented before the Engineering Association of the South, Jan. 13, 1906.

ing distance from the chute to the hopper was 23 feet.

A water supply was secured by sinking a well in the drainage channel just below the trestle, the water from this well being pumped by means of a gasoline engine into a tank placed on the trestle. From the tank a continuous stream of water was fed into the mixer through a flexible connection, a valve so regulating the flow that the necessary amount was delivered in the time required to mix a batch.

A drop-bottom car (see cut) of 1 cu. yd. capacity, running on 30-in. gauge tram tracks, conveyed all concrete from the mixer to the wall. The hinged bottom doors of this car were closed with a latch, which was withdrawn by means of a lever at the side of the car to dump the load. After dumping, the bottom doors closed automatically, and were latched by the lever above referred to. A trestle spanning the entire culvert, with the deck at a sufficient height to clear the top of the arch when completed, was constructed out of old car sills, and longitudinal tracks were built on the same directly above each wall, two small turntables connecting the longitudinal tracks with a cross track that extended to the mixer. This arrangement permitted dumping the concrete into its final position in the wall without rehandling. After reaching a point 2 feet above the spring line, one of the tracks was removed and the other shifted to a position directly above the center of the arch, so as to reduce the handling of concrete to a minimum. Three men were required to handle the car, and they made the round trip when going to the extreme end of the culvert in about three minutes, the mixer in the meantime discharging into a small hopper, which was discharged into the car upon its return.

The concrete consisted of a 1-3-6 mixture, slag and stone being used as the aggregate. It was intended to use slag exclusive, but delays in shipment of the same necessitated substituting stone for about one-third of the work.

All excavating for the foundation, unloading of material, mixing and placing of the concrete, was done by one of the regular concrete forces of the railway, consisting of 4 white men and 13 negroes, the rate of pay being as follows:

1 foreman, white..............	$3.50
1 mason, white...............	3.50
1 carpenter, white............	2.25
1 blacksmith, white...........	2.05
5 laborers, black, at $1.20......	6.00
8 laborers, black, at $1.10......	8.80
Total	$26.10

Usually this gang builds the forms as well as doing all other work; but owing to the size of the culvert and the haste to complete concreting before cold weather, the forms, arch centering, bins, tram trestle and working platforms were erected by a bridge crew of white men, whose pay ranged from $1.75 to $2.25 per day. This slightly increased the cost of building forms, but secured rapidity of construction of the culvert.

The concrete gang moved to the work on September 12 last, excavated 853 cu. yds. of earth, unloaded the material for and mixed and placed 1,217 cu. yds. of concrete, removed the forms and binds, loaded all timber used in construction, etc., and moved away on November 9. During this time they lost three days on account of rain and closed down one day for lack of material. The mixer was in operation 194 hours, and mixed 7,702 batches, or at the rate of 1 batch every 87 seconds during the entire time it was in operation. During the last ten days it mixed a batch every 78 seconds while running. The best short record made was 291 batches in five hours, being 1 batch every 63 seconds, or at the rate of 58 batches, equal to 9.2 cu. yds. of concrete in place per hour. This is about equal to the capacity of the machine, one-half minute being required to mix the concrete, and at least that much time is consumed in charging and discharging it. A No. 5 Chicago improved cube mixer, operated by a Bates & Edmund Motor Co. gasoline engine, was used, and gave satisfaction; but a larger size would have been more economical, as all cement had to be measured, which required an additional man, the amount required for each batch being two-thirds of a sack. Another objectionable feature of the small mechine was the size of the discharging hopper, which caused a tendency to choke if the entire contents of a wheelbarrow was dumped into it at once. One man was required, therefore, to keep the hopper open, thus causing a delay in charging the mixer, which materially reduced the daily output of the same.

For the purpose of comparing the cost of this culvert with that of others built by the railway, I have taken from the tables accompanying the paper of Mr. H. M. Jones on "Concrete and Concrete Costs," submitted to the Engineering Association of the South in October, 1904, four examples of culverts approximating the conditions existing at Yellow Bank, and have compiled with them the costs of this work. Table No. 1 gives the total cost of each of the structures, while in Table No. 2 is shown the cost of concrete work proper. An inspection of Table No. 1 shows that the labor cost at Yellow Bank is only 58 per cent of the labor cost at the Doe Creek culvert, McMinnville branch, the cheapest of the other culverts; which the material cost is nearly the same, the reduction being mainly the difference between the cost of slag used at Yellow Bank and of crushed stone used at the other place. The reduction in labor cost is due largely to the use of a mechanical mixer, although the large yardage and the economical methods employed in handling material were factors in bringing about this reduction.

CONCRETE BASEMENT FLOORS.

Basement floors in dwelling houses as a rule require only a moderate degree of strength, although in cases of very wet basements, where water pressure from beneath has to be resisted, greater strength is required than would otherwise be necessary. The sub-foundation should be well drained, sometimes requiring the use of tile for carrying off the water. The rules given for constructing concrete sidewalks apply equally well to basement floors. The thickness of the concrete foundation is usually from 3 to 5 inches according to strength desired, and for average work a 1—3—6 mixture is sufficiently rich. Expansion joints are frequently omitted, since the temperature variation is less than outside work, but since this omission not infrequently gives rise to unsightly cracks, their use is recommended in all cases. It will usually be sufficient to divide a room of moderate size into equal sections, separated by one-half inch sand joints. The floor should be given a slight slope toward the center or one corner, with provision at the lowest point for carrying off any water that may accumulate.

CHICAGO CEMENT WORKERS STRIKE.

Some 1,200 members of the Cement Construction, Floor and Sidewalk Layers' Union struck on July 9th for an advance of 5 cents per hour or 40c per day. The contractors objected to the advance because the work in hand was taken on the basis of 30c per hour union scale. This, with the increased price of cement, all falls upon the contractors, who have some $2,000,000 worth of work on hand. The strike finally involved some 2,800 men, including hodcarriers, carpenters and other trades dependent upon cement construction. After more than a week's idleness, the contractors were compelled to concede the advance demanded. Had the advance been demanded before the contracts were closed the loss of 40c per day would not have fallen upon the contractors.

The Iroquois Portland Cement Co. is to be operated by electricity from Niagara Falls, Canada side. The current will be transmitted under a pressure of 60,000 volts.

METHODS OF TESTING CEMENT FOR WATERPROOFING PROPERTIES.

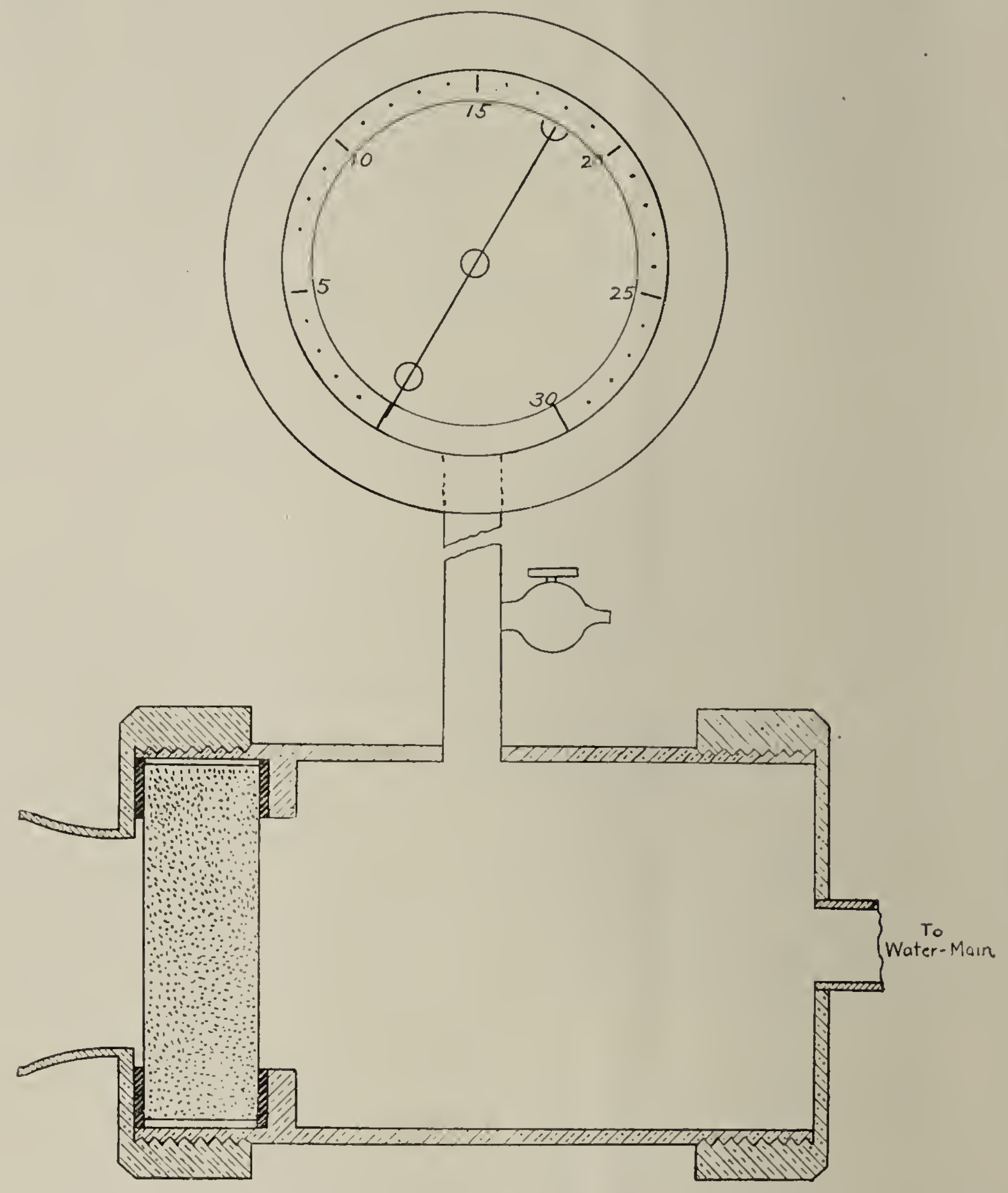
By W. Purves Taylor.

With the continually increasing scope of uses to which cement mortars and concretes are put, occasions frequently arise in which it is desired to make the construction waterproof so that it may resist either water under head or dampness and hence be entirely dry on the unexposed surface. To meet this condition several methods of waterproofing have been devised, which may be roughly divided into three classes: (1) methods involving the use of bitumenous compounds with or without the addition of paper or felt, the waterproofing substances being distinct and separate from the concrete; (2) surface washes applied to the surface of the hardened concrete, and (3) compounds added to the cement or concrete in mixing and hence forming an integral part of the concrete itself, it being with this last class that this paper is chiefly concerned. The many waterproofing compounds now in the market are so varied in character that it is extremely difficult to devise laboratory tests by means of which their suitability for construction may be determined, and furthermore it is most necessary that these compounds should be subjected to tests, for while some of them are based on sound principles and produce excellent results, others are so poor that placing them on the market is little short of arrant fraud.

It would appear that, to determine the resistance of a cement mortar to the action of water, the natural tests would be those of permeability and absorption, but unless the results of these tests be most carefully considered, misleading inferences are most likely to be drawn. Moreover simple as these tests are there is no standard method of performing them, so that results obtained in different laboratories are seldom comparable.

In the pursuance of the investigations of these compounds in connection with the work of your waterproofing committee the first method of testing permeability tried was that recommended by the French Commission on Standard Methods of Testing, which consisted of cementing a glass tube on the top of a cube of the cement mortar to be tested and then connecting this tube to a reservoir of water the height of which and hence the head of water acting in the tube being either 1-10, 1, or 10 meters, depending upon the permeability of the specimen. The writer was, however, unable to obtain results anything like comparable or uniform by this method, although a number of variations in the size of the specimens as well as in the size and position of the tube were tried, and in spite of the fact that the greatest care was exercised in the forming and manipulation of the specimen.

After these unsatisfactory trials, the form of apparatus shown in the accompanying illustration was devised, and has given more satisfactory results than any form so far experimented with. The specimen used is in the form of a disc three inches in diameter and one inch thick, which is made in a mould of spring steel fastened with a clamp or screw. The apparatus is made from a 3¼-inch brass pipe having a ring ½ inch wide fastened 1 inch from the end of the pipe. Rubber packing 3-16-inch thick is placed against this ring and also over the specimen so that by tightening the outer nut the test piece is securely locked into position. The orifice in the outer nut is 2 inches in diameter, while the pressure is indicated by a gauge under which is a pet cock through which the air can escape and by means of which the pressure is exactly regulated. For test, pieces of 1:3 mortar, the pressure of water should be 10 pounds, while the number of cubic centimeters of water per minute passing through the specimen gives a measure of the permeability.



In making permeability tests it is especially important that the manipulation of the specimen be uniform, or otherwise most discordant results will follow, for it appears that permeability is more affected by small deviations of method than probably any other test to which cement is subjected.

Especial care should be taken to see that the granulometric composition of the sand is kept uniform, and the mixing and moulding of the specimens should be performed with exceptional care. In the storage of the specimens there is no recognized standard practice although permeability is much affected thereby, storage in air increasing it, while storage in water decreases it, as the following example shows clearly, this test being made on a normal 1:3 Portland cement mortar, all tests on the same specimen:

Treatment.	Permeability. c. c. per minute.
7 days in water—14 days air	150
48 hours more in water	133
72 hours more in water	127
24 hours more in air	133
72 hours more in air	172
96 hours more in air	209
24 hours more in water	163
72 hours more in water	150

Another important factor affecting the results of the test is the time at which the reading is taken after the pressure has been applied to the specimen, the rate of permeability first increasing for from 20 minutes to an hour and then slowly decreasing. The pressure, of course, must always be the same in any series of tests, the rate of flow varying approximately with the square root of the head.

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*Read at the Atlantic City meeting of the American Society for Testing Materials, 1906.

In the test of absorption, there is comparative uniformity in practice except in regard to the treatment prior to immersion in water, some drying the specimen in an oven and others testing it merely air dry, the tests made in the first manner of course giving much greater values. Both methods of testing have strong arguments in their favor, but it is thought that tests on air dry specimens represent better the conditions of practice and that their results indicate more nearly the true water resisting properties of the specimen.

Several other tests for waterproofing are occasionally made, such as forming small bowls of the mortar and floating them in water, recording the time at which they sink, this test giving a measure of both absorption and permeability, but unfortunately not being capable of giving precise results and hence unsuited for a standard test, although well adapted to showing the comparative merits of any two mortars. Another test is made by spraying one side of a specimen or block from a standard nozzle and measurement being made of the time required for dampness to penetrate the face opposite the one on which the spray is applied, but such tests give practically no additional information when the absorption and permeability are known and are much less adaptable to standardization.

The following method has therefore been adapted tentatively as the standard for determining the water resisting properties of a cement mortar. Specimens are first made in accordance with standard practice in the shape of discs 1 inch in thickness and 3 inches in diameter, the mortar being made in the proportion of 1:3. The discs are kept in moist air 24 hours, then immersed in water six days and finally removed from the water and kept in dry air for 21 days more. At the end of this time (28 days from the time of making) they are weighed and placed in water for 48 hours, then weighed a second time and the percentage of absorption determined. The specimens are then immediately placed in the permeability machine before they have commenced to dry out, and subjected to 10 pounds water pressure, which is maintained for 10 minutes, and then the number of c. c. of water passing in a minute are measured, giving the value for permeability. A test should be based on the results from not less than five specimens, any results being discarded which are obviously in error. Of course when it is expected to use the mortar under unusual conditions, these conditions should also be duplicated as nearly as possible on additional test pieces, and tests made on specimens kept in acid or alkaline waters, in oil, in gas drip, and in other conditions will give most valuable information.

To show the character of results obtained by this method, a few preliminary series of tests will be cited, the first being on mixtures of Portland and natural cement, the results of which follow, all tests being made on 1:3 mortars.

Mixture.		Strength.				
% Portland.	% Natural.	7 days.	28 days.	4 mos.	Absorption.	Permeability.
100	0	301	357	361	9.5	794
80	20	279	361	410	8.9	753
60	40	251	347	439	7.0	340
40	60	203	324	411	6.7	380
20	80	150	259	375	7.1	(500)
0	100	84	173	292	9.6	640

It will be observed that the absorption and permeability are both least when the mixture is about half and half as result which might be expected. The high strength of these mixtures at four months presents also an interesting feature.

The following series shows a few tests made on mixtures of Portland cement and hydrated lime in 1:3 mixtures:

Mixture.		Strength.				
% Cement.	% Lime.	7 days.	28 days.	4 mos.	Absorption.	Permeability.
100	0	301	357	361	9.5	794
95	5	260	351	373	6.7	735
90	10	274	305	282	6.4	715
85	15	281	315	267	6.4	470
80	20	289	315	260	6.7	430
67	33	243	250	245	7.3	220
50	50	146	206	217	7.8	10

Which shows the great value of the use of this material in decreasing permeability, while small additions have but little effect on the strength. The last values of absorption are apparently anomalous and may be due to error.

The value of the permeability tests was still better shown in the examination of cement mortars treated with various compounds, the results of which will be presented later in the report of the waterproofing committee.

In closing, I would state that the purpose of introducing a discussion on this subject was due to the great difficulty experienced by the committee in properly testing the various waterproofing compounds submitted for examination, and it was thought that an open discussion on these tests would not only be of interest to the members, but of help to the committee in the pursuance of their investigations.

READING CEMENT CO. SOLD.

The estate of the Reading Cement Co. was sold at the Reading Exchange on the afternoon of July 19th by John M. Frame, trustee in bankruptcy. The tract of land and mill buildings at Molltown, Maiden Creek township, and a 28-acre tract were bid in by T. Jaeger Snyder for $17,435. Mr. Snyder is said to be the representative of the bondholders. The sale was well attended.

The Kansas cement industry is suffering from a scarcity of labor.

MEETING OF THE AMERICAN SOCIETY FOR TESTING MATERIALS.

The ninth annual meeting of the American Society for Testing Materials was held at Atlantic City, N. J., June 21st, 22d and 23d. All the sessions, which numbered six, were held at the Hotel Chalfonte. About 200 members were present and a very full program of papers was presented.

Two sessions were held Thursday, the first of which, at 3 p. m., was devoted to routine business and the election of officers, all the old officers being re-elected. The second session, at 8 p. m., was devoted to the reading of the annual address, which owing to the absence of the president, Dr. Dudley, in Europe, was delivered by the vice-president, Mr. Robert W. Lesley. Mr. Lesley took for his subject "The American Society for Testing Materials—Its Past and Future," and reviewed the history of the society from the day of its foundation, in 1898, as a branch of the International Association for Testing Materials to the present time, when it numbers over 800 members, 25 per cent of whom attend its annual meetings; something which can be said of perhaps no other American scientific society. A quotation from Mr. Lesley's address may be well inserted here to show what the society has done for the concrete industry:

"The growth of our organization as a clearing house for the specifications of the scientific societies of the United States has been marked. No steps in the preparation of specifications and the adoption of methods for manipulation of tests is proposed in any of the scientific societies to-day without the suggestion of the co-operation in the name of this body. This sentiment of co-operation among the national scientific societies is one of the best evidences of scientific development of the American mind, and the desire to procure in the most compact form the condensed thought of the greatest number of intelligent minds familiar with dealing with the subject brought up. It is this co-operation which has led to the successful promulgation by our society of no less than eighteen specifications during the past five years. It is this co-operation which has tended to make our society recognized as one of the leading ones in the United States, and one most devoted to work and most fruitful in results. This co-operation in a single industrial development, that of concrete and reinforced concrete, will have much to do with the forming of proper specifications for legislation in all the large cities of the country covering the construction of concrete and reinforced concrete. Further recognition of your society as a scientific body is shown by the appointment by President Roosevelt of your president and vice-president as members of the U. S. Advisory Board on Structural Materials and Fuels, a board composed of the leading scientific societies of the United States, and of the heads and representatives of the Army, Navy, the Panama Canal Commission, the Geological Survey and other important branches of the government. Recognition was more marked in the case of our body than any other scientific body in the selection of our President Dudley as president of the Advisory Board."

At the session Thursday night, Mr. Richard L. Humphrey delivered an exceptionally interesting talk on "Some Effects of Earthquake Shock and Fire on Materials and Buildings at San Francisco." This was profusely illustrated by lantern slides and proved to be one of the strongest arguments for reinforced concrete yet advanced.

Two separate meetings were held at the session Friday morning by the sections on Iron and Steel and on Cement and Concrete. The latter section held its meeting in the palm garden of the hotel overlooking the "boardwalk" and the surf and was presided over by Mr. R. W. Lesley. The first paper on the program was the report of Committee I, on reinforced concrete, which in the absence of Prof. Turneaure, its chairman, was presented by Mr. Humphrey. So far the work of the committee has been merely a critical examination of the work done at the various colleges and technical schools under the direction of the committee. The report characterized the work of the college laboratories, done by students, as being disappointing and of much less value than had been expected. This wholesale condemnation of the research work on reinforced concrete done in the engineering schools elicited a strong protest from Prof. A. N. Talbot, and after some discussion the committee agreed to modify its report with respect to the objectionable portion. Prof. Talbot thought that the committee, unless they did this, showed very poor appreciation of work which on the whole was not only valuable but had also required much painstaking and faithful labor for its accomplishment.

Prof. Getano Lanza and Prof. S. J. Tilden then read papers describing in detail a series of tests made upon reinforced concrete beams by the authors. Mr. W. Purves Taylor followed with an interesting paper, "Note on Compression Tests of Cement," in which the results of some 3,000 tests of short cylinders, one inch high and one inch area of cross section, were given. In the discussion which followed, attention was called to the fact that in order to secure the true compression break, theory requires the cylinder to be over twice the height of those used. Mr. Taylor acknowledged this fact, but stated that the smaller cylinders could be much easier molded and that duplicate tests showed a uniform ratio of difference which serve as a guide for correcting results. Mr. Sanford Thompson also read a paper on the consistency of concrete at this session.

Mr. Clifford Richardson was down on the program for a paper entitled "The Present Status of Our Knowledge in Regard to the Constitution of Portland Cement." The author was unable to be present, however, much to the regret of the many cement experts present, as it was understood that it was his intention in this paper to radically alter some of the views previously advanced by him as to the constitution of Portland cement; more recent investigations by several physical chemists of note having thrown decided doubt upon the existence of tricalcium silicate and tricalcium aluminate.

At the meeting of the session on cement, concrete and asphalt, Saturday morning, the most important paper in the concrete line was perhaps that of Prof. Ira H. Woolson on "Investigation on the Conductivity of Concrete and the Effect of Heat upon Its Strength and Elastic Properties." It may be remembered that Prof. Woolson read a paper last year before the same society on a series of tests showing that both the strength and elasticity of concrete were rapidly diminished by the application of even comparatively low heat for moderate periods of time upon all sides of small blocks of concrete. The results of these tests were quite contradictory to well established evidence of the fire-resisting qualities of concrete. The writer had made a single experiment upon the heat conductivity of concrete, and from this it seemed that the fire-resisting quality of concrete is due to its low conductivity. The paper read this year was an extended investigation of the conductivity of concrete and established the value of concrete as a fire-resisting material. The paper is published in full in this issue.

As Prof. Wilson had found gravel concrete to be more affected by heat than concrete made of broken limestone or trap rock, the discussion largely took the form of a debate as to the value of gravel concrete for concrete aggregate.

Following the discussion of Prof. Woolson's paper, Mr. R. K. Meade called attention to the fact that apparatus for determining the specific gravity of cement was very often incorrectly graduated, and that the failure of the Jackson apparatus to give results agreeing with the standard Le-Chatelier apparatus, was due in most cases to improper calibration of the former. Mr. Meade also described a new method for taking the specific gravity of samples of ignited cement. The title of the paper was, "The Determination of the Specific Gravity of Cement."

Mr. C. N. Forrest next described "A New Device for the Mechanical Sifting of Concrete Aggregates," which consists of a series of sieves set one above the other, each one a size smaller than the one above. The sieves are given a combined rotary and vertical motion, somewhat like that used in hand sampling, by a mechanism operated by a hand crank or by power.

A paper by Mr. J. Y. Jewett on "Some Sand Experiments Relating to per cent of voids and tensile strength of cement mortars," was read by Mr. R. L. Humphrey in the absence of the author. Mr. Jewett's experiments showed that the sand having the smallest percentage of voids did not have the highest strength. The discussion of the paper was devoted largely to the relative merits of the various methods of finding the percentage of voids. The weight of opinion seeming to lie on the side of placing the sand, etc., in a percolator and running in water from below upwards from a burette to the surface of the sand.

Two other papers at this session were devoted to asphalts, and were read, one by Mr. A. W. Dow, and the other by Mr. C. N. Forrest, in the absence of its author, Mr. Clifford Richardson.

At the session Saturday afternoon Mr. W. P. Taylor read a paper on "Methods of Testing Cements for Waterproofing Properties," in which he described the methods in use by the Philadelphia city testing laboratory for this purpose.

The ninth annual meeting of the society was then brought to a close by a brief joint session, at which various miscellaneous matters of business were transacted.

A TOBACCO SUBSTITUTE.

Dr. Martin, health officer of Groton, England, writes the London Lancet that the petals of the chrysanthemum dried and smoked are a good substitute for tobacco, yielding a satisfactory smoke, and is especially valuable in cases of weak heart and dyspepsia, the entire physical condition of the sufferer having improved after a course of smoking chrysanthemum petals.

C. D. Quick, cement expert, has recently been appointed Superintendent of the works of the Alma Cement Co., Wellston, Ohio, J. N. Kennedy, resigned.

THE DETERMINATION OF THE SPECIFIC GRAVITY OF CEMENT.*

BY RICHARD K. MEADE, CHEMIST, THE DEXTER PORTLAND CEMENT CO., NAZARETH, PA.

Some time ago the writer undertook a series of experiments to determine the reliability of the various forms of apparatus now in common use, both in this country and abroad, for taking the specific gravity of cements. The result of this investigation is given below in the hope that it may prove of interest to the members of this society.

As the first step to this investigation, four samples of cement were prepared by drying at 100° C. and passing through a No. 50 sieve. The specific gravity of each sample was then carefully determined by the use of a 50 cc. pycnometer or specific gravity bottle. Kerosene, freed from water by distillation over lime was employed for the liquid and the temperature was controlled to 0.1° C. The specific gravities of the samples were compared with water at 15° C. and were 3.088, 3.121, 3.193 and 3.240, respectively. The samples were kept in airtight fruit jars.

The specific gravities of the four samples were then taken with Le Chatelier's[1] apparatus, Jackson's[2] apparatus, McKenna's[3] apparatus and Schumann's[4] apparatus. The results of these determinations were as follows:

Le Chatelier's apparatus gave results uniformly 0.01 too high.

Jackson's apparatus gave results from 0.13 to 0.15 too low.

McKenna's apparatus gave fairly satisfactory results.

Schumann's apparatus gave satisfactory results.

The error in the case of the Jackson's apparatus seemed most probably due to improper calibration of the flask and since all volumetric apparatus is likely to be incorrectly graduated, all four forms of apparatus were examined to ascertain how carefully this had been done. The apparatus in all cases was washed free from oil with benzine, ether, alcohol and water, in the order named, freed from cement particles by washing with a little hot dilute hydrochloric acid, and from dust, etc., by allowing a mixture of potassium bichromate water and sulphuric acid to stand in it over night. After washing and drying it was calibrated.

In the Le Chatelier apparatus, Fig. 2, the bulb, *b*, should hold exactly 20 cc. and the stem, *a*, between the graduations 0 and 3 should hold 3 cc. The bulb of the apparatus tested held 20.05 cc. at 70° F. or an error of 0.05 cc. The graduations on the stem were found to be accurate, consequently the total error amounted to 0.05 cc., and this amount (equivalent to an error of about 0.008) was added to each reading in making a determination with this particular Le Chatelier apparatus.

In the Schumann apparatus, Fig. 3, the stem, *a*, is graduated into 40 cc. and these again into tenths cc. These graduations were found to be accurate.

In the Jackson apparatus, Fig. 1, the bulb, *a*, of the burette should hold 180 cc. and the stem, *b*, 5.71 cc. The flask, *c*, should hold 200 cc., or if the burette bulb holds less or more than 180 cc., it should hold the contents of the bulb plus exactly 20 cc.

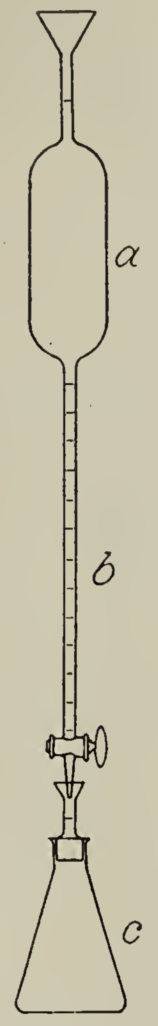

Fig. 1.

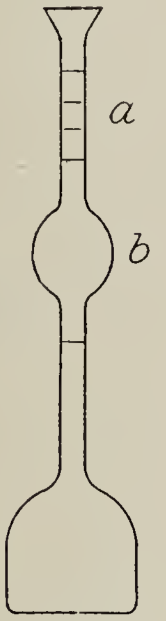

Fig 2

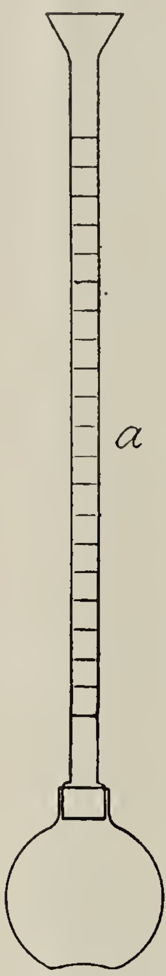

Fig. 3.

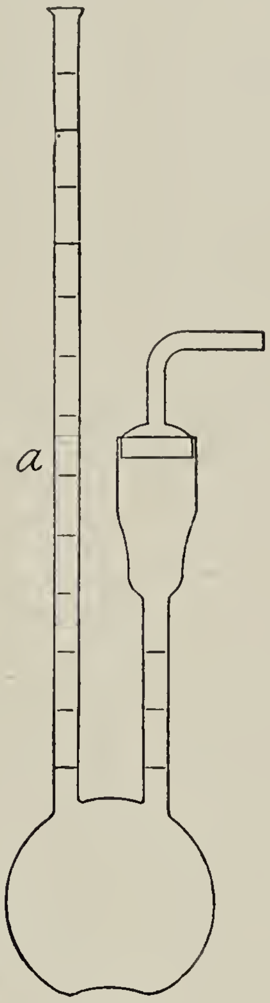

Fig. 4

The flask of the apparatus in question held the contents of the burette bulb plus 19.3 cc. or an error of 0.7 cc. (equivalent to an error of from 0.12-0.15 in specific gravity). The graduations on the stem were found to be correct. All of the apparatus was calibrated by running in water or kerosene from a calibrated 25 cc. burette, graduated into 1/20 cc. and easily read to 1/40 cc.

The flask of the Jackson apparatus was then recalibrated by adding 20 cc. of water from the burette and then the bulb of the Jackson burette full (180 cc.) of water.

Determinations made with the recalibrated Jackson apparatus and by applying the correction to the Le Chatelier apparatus, were very satisfactory as the following table will show:

TABLE OF RESULTS.

Cement No. Form of Appratus Used.	1.	2.	3.	4.
Pycnomiter	3.193	3.088	3.121	3.240
Jackson's	3.19	3.09	3.12	3.23
LeChataelier's ...	3.20	3.09	3.12	3.24
McKenna's	3.19	3.08	3.13	3.25
Schumann's	3.19	3.09	3.12	3.24

To guard against improperly calibrated specific gravity apparatus, the tester should either check the volume of the bulb of the Le Chatelier apparatus and of the flask of the Jackson apparatus or else request the maker of the apparatus to furnish with the same a certificate from the U. S. Bureau of Standards testifying to its trustworthiness. Of the four forms of apparatus, three are affected by any change in the temperature of the liquid between the two readings. With the Jackson apparatus, a table is supplied which gives the correction to be applied. In the other forms of apparatus, precautions are usually taken to guard against changes in temperature, such as immersing the instrument in a jar of water.

The coefficient of expansion of kerosene is 0.0009 per degree C., or 0.0005 per degree F. The Le Chatelier apparatus has a volume of 130 cc., consequently the expansion due to a rise of one degree C. amounts to 0.12 cc., after deducting for the expansion of the glass, or an error of approximately .018 in specific gravity.

The Schumann apparatus holds from 110 to 150 cc. and hence has about the same error. The McKenna apparatus, however, has a volume of 300 cc. and, since the stem is graduated into only 11 cc., the sample is smaller (between 30-35 grams) than that used for either the Le Chatelier or the Schumann apparatus. The expansion per degree C. rise with this apparatus amounts to 0.27 cc., or an error of approximately 0.07 in specific gravity. Dr. McKenna has now improved his apparatus by blowing a thermometer into the bulb between the two tubes allowing temperature corrections to be easily made. The bulb itself is much smaller, doing away with the large error due to expansion, and the graduated tube is narrower and longer, making the apparatus much more delicate.

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[1] Proceedings of the American Society for Testing Materials, Vol. IV., page 112 (1904).

[2] Journal of the Society of Chemical Industry, June 15th, 1904; also Engineering Record June 16th, 1904.

[3] Journal of the American Chemical Society, XXI, 50 (1899).

[4] See Butler's "Portland Cement."

*Read at the Atlantic City meeting of the American Society for Testing Materials, June 23d, 1906.

Since it is by no means an easy matter to keep the temperature constant during a determination, unless water, oil, cement and apparatus are allowed to remain side by side for some time, I have usually found it more convenient to take the temperature of the oil just before bringing it to the zero point and just after making the final reading. With the Le Chatelier apparatus 0.12 is then deducted from the final reading for every degree C. rise or added for every degree drop in temperature of the second reading over the first.

The chief objections I have found to the standard Le Chatelier apparatus is the time and care necessary to run the cement into the apparatus. The same objection holds good for both the Schumann and McKenna forms of specific gravity apparatus. McKenna's apparatus must also be protected from even slight changes of temperature, and requires a higher degree of manipulative skill than any of the other three forms. The Jackson apparatus is much more convenient than any of the others and is just as accurate, provided it is properly graduated. This latter may be made sure of, as I have suggested, by having it certified to by the U. S. Bureau of Standards. The makers could have this done at small cost in lots of ten or more. The greatest objection to the Jackson apparatus when properly graduated is the necessity of drying the flask before each determination. This can be gotten around by graduating the flask wet (with kerosene), say after draining two minutes in an inclined position so as to allow the bottom also to drain and removing the suspended drop. Flasks so graduated give just as accurate results as do dry flasks and time may be saved by using the wet flask.

It is sometimes necessary to take the specific gravity of samples of cement after ignition at a low red heat. With the appliances at hand in the ordinary cement testing laboratory it is a difficult matter to ignite more than 5 or 10 grams at one time. None of the forms of apparatus ordinarily used for taking the specific gravity of cement is suited to the use of such a small sample. For this purpose I have used the method given below:

From one arm, *a* (the left), of the balance take off the balance pan and in its place suspend from the stirrup, as shown in Fig. 5, a 50-gram weight, *b* (or any weight sufficient to more than balance this pan such as a lead fishing sinker). Take the weight of this on the other pan and call this weight "A." Now attach to this by a fine silk thread or wire a 50 or 100 cc. pycnometer, *c* (a small 100 cc. Erlenmeyer flask with a narrow mouth will also do). Weigh the pycnometer so suspended and call the total weight "B." B — A will then be the weight of the pycnometer in air. Now fill the pycnometer with water in the usual way, carefully forcing out all air, and weigh suspended in a tall narrow breaker or jar, *d*, of water. Call this weight "C." "Loss in water" = (B — A) — (C — A). Now dry the pycnometer, fill with oil and weigh suspended in kerosene. Call this weight "D." "Loss in kerosene" = (B — A) — (D — A).

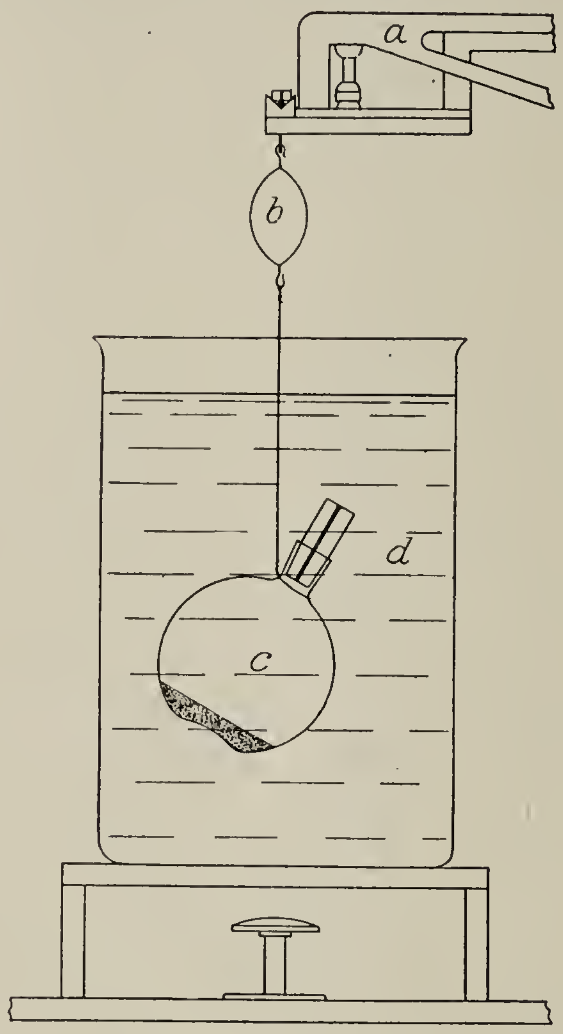


Fig. 5.

Specific gravity of the kerosene =

$$\frac{\text{"Loss in Kerosene"}}{\text{"Loss in Water"}}$$

Now remove the pycnometer and pour out half of the kerosene, introduce W (usually 5 to 10) grams of the ignited cement and mix thoroughly by twirling around the contents of the pycnometer. Fill the pycnometer to the neck with oil and allow a few minutes for the contents to settle. Fill the neck fully by pouring down the sides, suspend in kerosene and weigh as before. Call weight "E."

Specific gravity of the cement =

$$\frac{W \times \text{Specific Gravity of the Oil}}{(W + D) - E}$$

The temperature of the oil should not change more than 2° C. during the time between the taking of its own density and that of the cement. The weight of the pycnometer suspended in water need be taken but once. After this is done a determination can be easily made in ten minutes. Even the finest particles of the cement settle in a few minutes and results obtained by the method are very trustworthy, as the following will show:

Sample No.	Pycnometer. Method.	Suspension Method.
1	3.193	3.190
2	3.088	3.086
3	3.121	3.120
4	3.240	3.241
5	3.135	3.136
6	3.027	3.026

An example of the calculation is given below:

Weight to balance (A)	11.823
Weight of pycnometer suspended to the above in air (B)	40.825
Weight of pycnometer suspended to the above in water (C)	29.181

"Loss in water" = (B — A) — (C — A) = (40.825 — 11.823) — (29.181 — 11.823) = 11.644.

(The above are permanent results and provided the same pycnometer or flask is used for each determination need be obtained but once.)

Weight of pycnometer suspended in kerosene (D) 31.662.

"Loss in oil" = (B — A) — (D — A) = (40.825 — 11.823) — (31.662 — 11.823) = 9.163.

Specific gravity of oil =

$$\frac{\text{Loss in Oil}}{\text{Loss in Water}} = \frac{9.163}{11.644} = 0.787.$$

Weight of pycnometer + 10 grams of cement suspended in kerosene (E), 39.152.

Specific gravity of cement =

$$\frac{W \times \text{Sp. Gravity of Oil}}{(W + D) - E} = \frac{10 \times 0.787}{(10 + 31.662) - 39.152} = \frac{7.87}{2.510} = 3.136.$$

Chas. P. Williams, representing the U. S. Geological Survey, is looking for raw cement materials in Wyoming. The Cheyenne Tribune states that a government Portland cement plant will be erected in that state in the vicinity of Absaraka Park, near Cheyenne.

CEMENT FOR MINES.

Concrete is being substituted for timber for supporting the underground excavations. The Calumet and Hecla copper mine was among the first to employ concrete instead of wood. This company, being one of the largest owners of timber land in Michigan, have taken time by the forelock by saving their forest reserves, knowing they will eventually be compelled to rely on a substitute, which undoubtedly will be cement. Mining companies consuming from 10,000,000 to 30,000,000 feet of timber annually, figure on a shortage in the near future.

Concrete has good properties; it is durable, and will not be affected by acidulous water. It is excellent for building shafts (as is done at some of the larger mines in Germnay), for mill foundations, and for numerous other purposes.

In Pennsylvania collieries the practice is gaining favor to use cement for lining pipes and pump chambers, in order to prevent their deterioration by the sulphur-impregnated water. At these collieries it is customary to drill a hole, place a wrought iron casing therein, surround with cement grout, and pump the water to the surface. When the casing is eaten away, the hole is protected by the cement lining.

In the Michigan copper region there are millions of tons of crushed rock and quartz on the dump which makes the best possible aggregate for high-grade concrete. This will help along the use of cement in that region.

ECONOMY IN THE MANUFACTURE OF STEEL.

The waste gases from blast furnaces are now being utilized to generate power in gas engines. This power is used to produce compressed air to operate the furnaces and to generate electricity to operate the machinery in the rolling mills. The Allis-Chalmers Company is furnishing the gas engine installation for the U. S. Steel Corporation plants as follows: 15,000 H. P. to the Illinois Steel Co., 4,000 H. P. for the Homestead plant of the Carnegie Steel Co., 35,000 H. P. for the Indiana Steel Co.

Gas engines thus far purchased from Allis-Chalmers Company by the United States Steel Corporation will have an aggregate normal capacity of 68,000 H. P., and represent a value of over $2,000,000. Of this amount more than half is covered by one contract, making it the largest single order ever placed, in this country or abroad, for gas engines to be used either in blast furnaces for blowing purposes or as prime movers for electric generators.

CONCRETE, A COMMODITY TO ADVERTISE.

Printers' Ink believes that a great advertising campaign undertaken by producing corporations would do reinforced concrete construction a world of good. It says that reinforced construction means an increased use of steel—so great an increase that perhaps the steel corporations alone could afford to pay for a general cement campaign. The movement might even extend to the real estate field. Difference in cost between frame cottages, brick residences and concrete construction will ultimately attract attention from that enterprising clientele, if it hasn't already. Here, of course, the advertising of concrete houses becomes a purely local proposition, to be handled by the newspaper publisher.

"These are only general lines of probable development. Concrete now furnishes the topic for dozens of newspaper and magazine articles, and even editorials. The two chief acts with regard to cement and concrete to-day are an enormous, growing demand, with a boundless supply to be delivered in infinite forms. In 1889 we produced only $500,000 worth of Portland cement. In 1903 we produced $27,713,319 worth. Reinforced concrete construction is fire and rainproof, practically indestructible when built properly. It is so cheap that in Liverpool a $17,000 brick dwelling was lately duplicated for $6,000 in cement. It has been employed within the past few years for many kinds of buildings in this country, from skyscrapers to cottages, bridges and outbuildings."

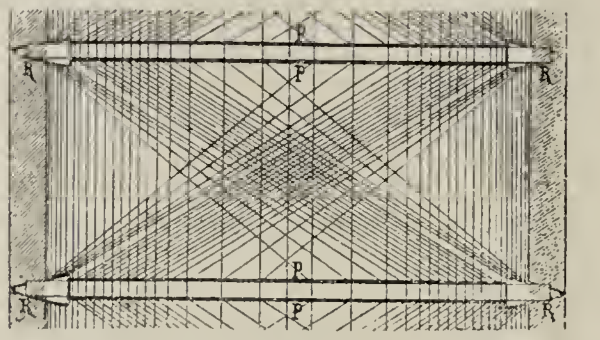
The Santa Fe Railway Co. will erect a large reinforced concrete freight depot at Los Angeles. The building will be 1,320 feet long by 91 feet wide, with clear spans between columns of 60 feet. Harrison Albright, architect, of Los Angeles, has prepared plans and specifications for the structure. Carl Leonardt has been awarded the contract for $280,000. The building will be erected under the supervision of General Manager Wells and Acting Chief Engineer Morse of the Santa Fe Railway Company.

The Cement and Iron Manufacturing Co., of Los Angeles, and Lindcove, Tulare county, Cal., on the line of the Southern Pacific railway, propose to erect a modern cement plant on a 2,000-acre tract near Lindcove. This land has been divided into 5-acre tracts and is being offered for sale to settlers. Special excursions from Los Angeles to Lindcove are being run Sundays. The inducement to purchase land being the prospective cement and iron works.

Reinforced Concrete Passenger Depot, Hotel, Curio Store and Power House, for the Atchison, Topeka & Santa Fe Ry. Coast Lines at Ash Fork, Arizona. C. A. Morse, Acting Chief Engineer A., T. & S. F. Ry.; Harrison Albright, Architect, Homer Laughlin Bldg., Los Angeles, Cal.

NEW SYSTEM REINFORCED CONCRETE CONSTRUCTION.

The John C. Johnson Grocery Co. office and warehouse building at Minneapolis, Minn., now under construction, is to be a five-story reenforced concrete building without girders, the floors being carried on columns. At the height of each floor iron rods spread out in the form of a circle 8 feet in dameter from the top of each column, the columns being spaced 16 feet from centers, forming a 16-foot span, with wire network extending from column to column to distribute the load on the floor. The entire network of steel bars and wire netting being covered with concrete, there will be neither beam or girder in the five floors. The construction is known as Mushroom Reinforced Concrete, from its resemblance to the mushroom when opened out. The wire being distributed similar to the Mutrai system, which is extensively used in France. In the Mutrai system the wire netting is imbedded in the heavy walls of the building and carried across the floors at an angle of about 45 degrees, while other wire strands are laid across the floor space from wall to wall as shown in the cut. The Prince Construction Company of Minneapolis are the inventors of the new system and is the contractor for the building.



Matrari System.

The Montana Portland Cement Co. has been incorporated. Capital, $600,000. General offices at Bozeman; works, Monticello, Gallatin county, Montana. The officers of the company are: President, Ed. C. Davis; secretary, Fred. T. Osborn; treasurer, W. W. Livingston. The plant will be located at Monticello, is on the Northern Pacific Railway and on the surveyed line of the C., M. & St. P. Ry., now under construction. The company owns 120 acres of limestone land, the rock rising for 300 and 500 feet above the surface. An 800-barrel plant is to be installed with the latest machinery. Water power to the extent of 1,000 horsepower is available. The clay will be brought from Whitehall, about eighteen miles from the plant.

The Standard Portland Cement Co. works at Leeds, Jefferson Co., Ala., are well under way. The steel framing of four buildings was up and being painted late in June. Mr. J. B. Elliott, of Leeds, is promoting a second cement plant to be located in Jefferson county.

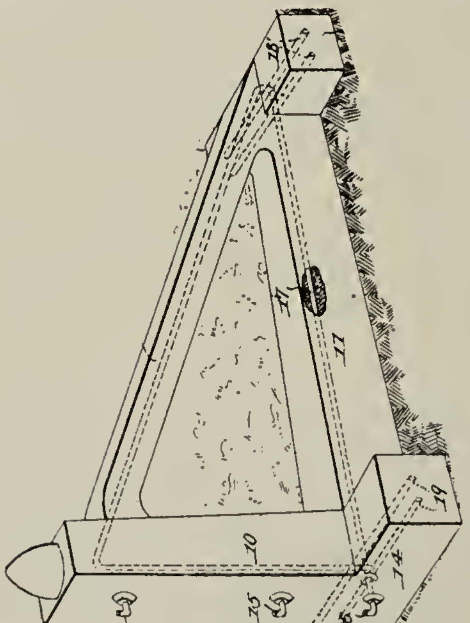
The U. S. Government is to send a commission to Germany for the purpose of investigating the manufacture and use of de-naturized alcohol, and report on the same.

The Farmers' Union of South Carolina has decided to erect a number of hollow concrete warehouses for the storage of the cotton crop to save expenses and commissions of middlemen. Certain designing men have circulated reports that insurance rates would be excessively high on concrete block constructed warehouses in order to discourage the movement. The farmers expect to have a sufficient number of these warehouses to maintain a mutual insurance company of their own.

The Farmers' Union warehouse business we trust will soon be in shape to take care of itself in every other way as well as take care of the price of cotton.—Herald & News, Newberry, S. C.

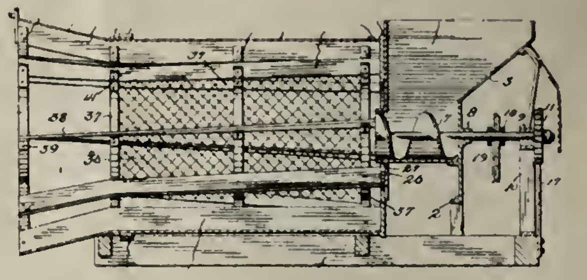
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

823,655. Fence-Post. Joseph W. Westlake, Marysville, Ohio. Filed Oct. 6, 1905. Serial No. 281,692.



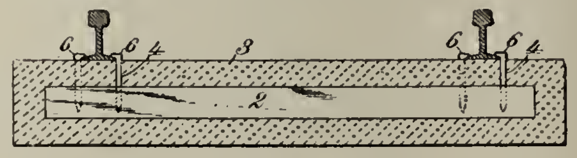
Claim.—2. A plastic fence-post comprising a horizontally-disposed base having a cross-head at each end thereof and extending laterally beyond the general longitudinal plane of the base, a standard secured to the base at a point intermediate one of the cross-heads, and an integral brace spaced from the base and connecting the free end of the standard and the intermediate portion of the opposite cross-head.

824,204. Concrete-Mixing Machine. William H. Phillips, Columbus, Ohio. Filed March 20, 1905. Serial No. 250,937.



Claim.—1. In a machine for mixing building materials, the combination with feeding means, of a mixing-drum formed with a delivery-spout and arranged in communication with the feeding means, means for imparting motion to the drum, and a removable mixing-body fitting snugly within the drum and normally revolving therewith, but arranged to be moved independently thereof to scrape the inner periphery of the drum.

824,649. Railway Cross-Tie. Luphfer I. Hart, Vanatta, Ohio, assignor of one-third to Willis M. Shipley, Vanatta, Ohio. Filed April 25, 1906. Serial No. 313,607.

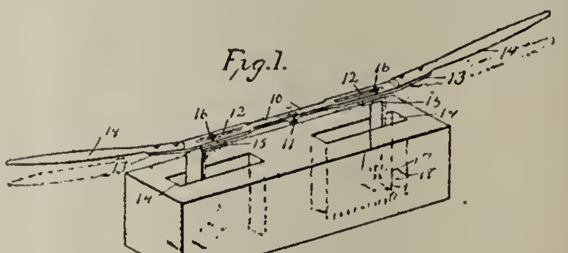


Claim.—1. A railroad-tie composed of a wooden core, and a cement body wholly surrounding the core, the latter extending practically the entire length of the tie.

2. A railroad-tie composed of wooden-core means, and a cement body wholly surrounding the wooden-core means.

3. A railroad-tie composed of wooden-core means, and a cement body wholly surrounding the wooden-core means, said cement body having spike-receiving holes.

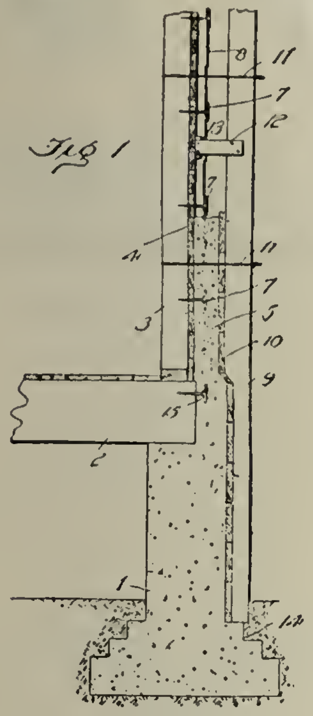
824,822. Cement-Block Lifter. Edward H. Samuelson, Boone, Iowa. Filed July 31, 1905. Serial No. 271,956.



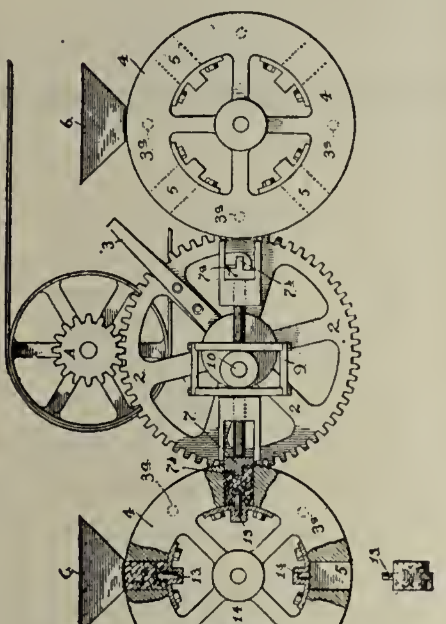
Claim.—1. In an implement of the class described, the combination of two bars hinged together, means for limiting the movement of the hinge-joint, handles on the bars and engaging members fixed to the bars and extended downwardly and outwardly therefrom.

824,823. Concrete-Wall House Construction. Edward E. Schackner, Denver, Colo. Filed July 13, 1905. Serial No. 269,475.

Claim.—1. In concrete house construction, a frame of studding and sheathing including the foundation-joints, a facing-wall of concrete, and means for strengthening and anchoring said wall to said frame and to said joists, consisting of headed anchors driven into said frame and into the ends of the joists and their heads embedded in said wall, and a reinforcing anchorage of widely-spaced wires, each wire separately connected to the heads of the anchors and running from one to the other in different directions, each wire forming a brace within and throughout the body of the wall and connected to said foundation-joists.



824,924. Concrete - Block - Making Machine. William H. Fulcher, Oakland, Cal. Filed Sept. 29, 1905. Serial No. 280,609.

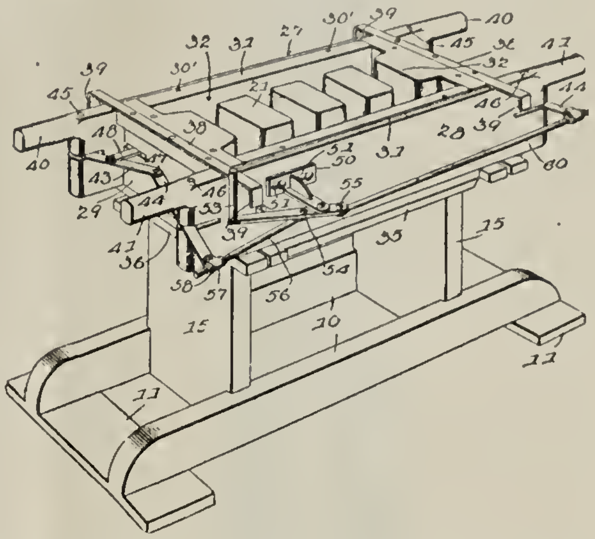


Claim.—1. A concrete-block-making machine having in combination a wheel or drum and a horizontally-disposed shaft therefor, said drum having molds opening through its periphery, and said molds having sockets in their bottom adapted to receive and support removable pins; a hopper vertically disposed above said drum and adapted to fill the molds as the latter successively pass below its bottom; a second drum journaled parallel with the first-named drum, and having a single arm fixed to it and projecting radially beyond the periphery thereof; lugs on the first drum, with one of which said arm engages at each revolution of said drum whereby the first drum is intermittently revolved; a guided pressure-plunger arranged horizontally in line with the molds; and an eccentric on the axis of the second drum by which the plunger is reciprocated to compress the material within the mold.

825,489. Block-Machine. Charles L. Scott, Riceville, Iowa, assignor to C. L. Scott Mfg. Co., Riceville, Iowa. Filed Jan. 26, 1906. Serial No. 298,048.

Claim.—1. In a block-moulding machine, a pallet having spaced projections extending from both of its sides and its ends, and side and end mold-box members having depending portions which fit between said projections, whereby said members are held from independent play in the direction of their lengths, said mold-box members being free to move in straight lines toward and from molding position.

2. In a block-making machine, side and end members arranged to move outward in directions at right angles to the faces of the molded block, the side members having extended end portions, levers pivotally connected to the extended portions and to each other, an operating-lever having a fulcrum carried by one of said side members, a rod connecting the operating lever to the sets of connected levers, and links extending from said connected levers to the end members.



825,604. Fittings for Concrete Casings. Frederick A. Koetitz, San Francisco, Cal. Filed Mar. 8, 1906. Serial No. 304,904.

Claim.—1. Hollow concrete casings formed in sections capable of being sunk in the earth at the bottom,

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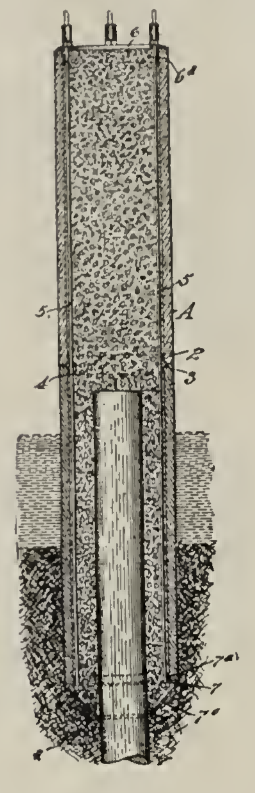
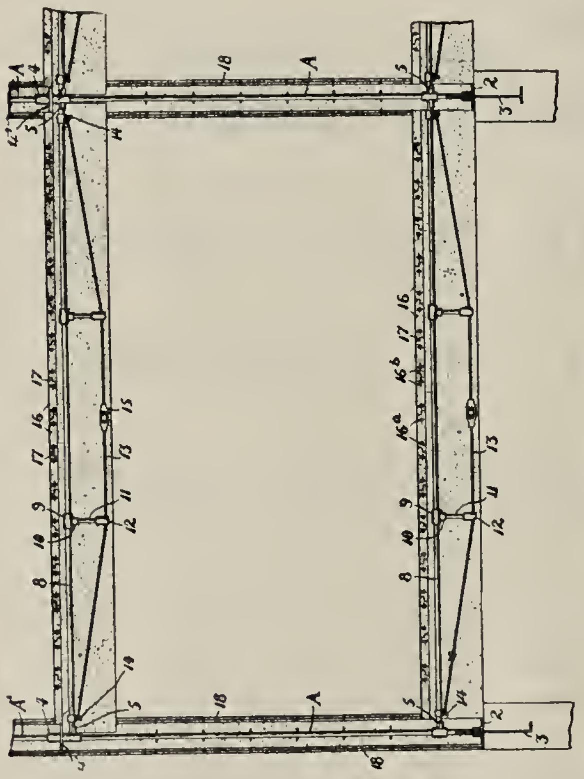
and over piles already in place, sleeves forming splices at the junction of the sections, tie-rods extending longitudinally through the casings, said sleeves having perforated flanges through which the rods pass, and concrete filling within the casings.



825,627. Reinforced Concrete Construction for Buildings. Charles P. Weeks, San Francisco, Cal. Filed Aug. 9, 1905. Serial No. 273,367.



Claim.—3. Structural building material, consisting of metal tubes with base-plates, continuation joint-sleeves having supporting-plates and having below said plates projecting brackets, said tubes and base-plates and said sleeves being embedded in concrete so as to be superposed to form columns of any length, and beams or girders formed of metal pipes with truss-supports embedded in concrete, and struts and truss-wires suspended from the beams or girders and embedded in the concrete therewith, the ends of said girder-pipes being supported upon and secured to the brackets of the columns.

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General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.

U. S. GOVERNMENT ARIZONA CEMENT PLANT SHUT DOWN.

E. Duryea, representing the U. S. Reclamation Service, who had charge of the erection of the government cement plant at Roosevelt, Ariz., says the plant has shut down on account of lack of storage room. There are now 11,000 barrels of cement on hand. The contractors for the dam are behind on their work. The plant has a capacity of 350 barrels per day. This is much more than the contractors' daily requirement.

Mr. Duryea has located a suitable raw cement material near the foothills of the Camelback mountains, a short distance from Phoenix, Ariz. The Roosevelt plant may be removed to this deposit to manufacture the cement required for the project of a dam above Phoenix for irrigation purposes.

W. J. Oliver, Knoxville, Tenn., seems to be looking for a location for a cement plant either in Kentucky or Tennessee. A number of towns in both states claim the Oliver plant will be located in their midst. Mr. Oliver is associated with J. H. Bartlett of Middlesboro, Ky.

The Pembina Cement Co. is now producing 350 barrels of cement per day. The cement is taken by wagon nine miles to the nearest station.

Owing to the high price of cement at Los Angeles, the Board of Public Works is considering the erection of a Portland cement plant to manufacture its own cement in order to reduce the cost of cement required for constructing the Owens River conduit which is to furnish the city with its water supply.

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Superintendent for large Portland Cement plant in the Middlewest; must be good engineer. Should understand both wet and dry process. Give reference and salary expected. Address P. O. Box 84, Detroit.

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WANTED

CEMENT BURNER, experienced in wet process. Apply immediately, giving references, stating age, experience, salary wanted, whether married or single, and how soon could come. Address "Cement." care of CEMENT & ENGINEERING NEWS.

WANTED

An experienced chief mechanic and millwright in cement plant having eight kilns. Will pay good salary to responsible man, and one who can take charge of repairs to machinery. Give full description of past engagements, and submit references. Address "Box E," care of CEMENT AND ENGINEERING NEWS, 22 Fifth Ave., Chicago, Ill.

Superintendent wanted for cement mill using dry process. Answer stating previous experience and salary desired. Give references, and state when at liberty. Communications confidential. Alabama Portland Cement Co., Demopolis, Ala.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

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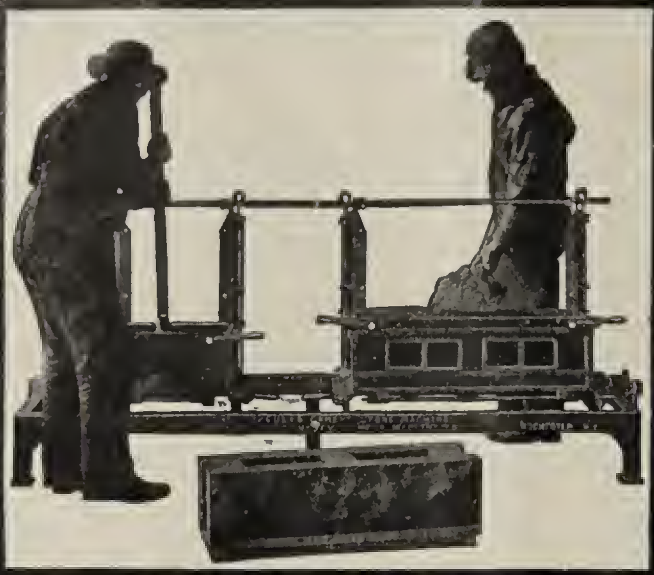

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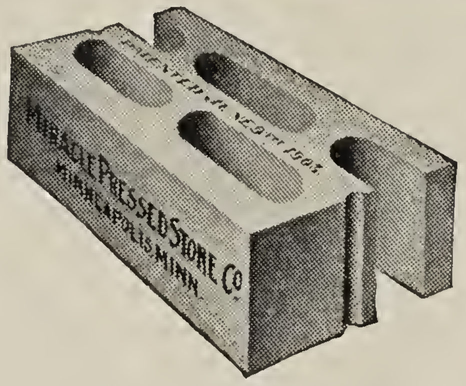

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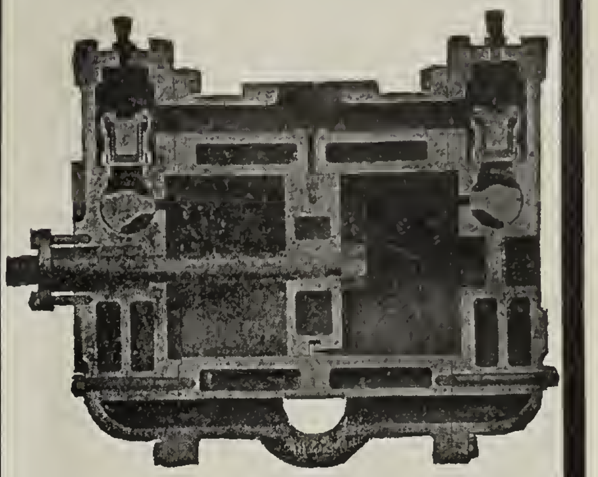

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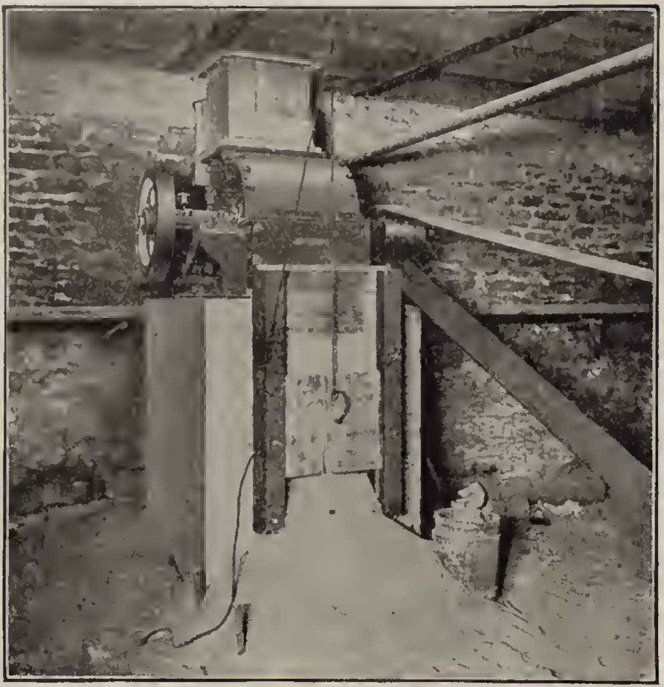

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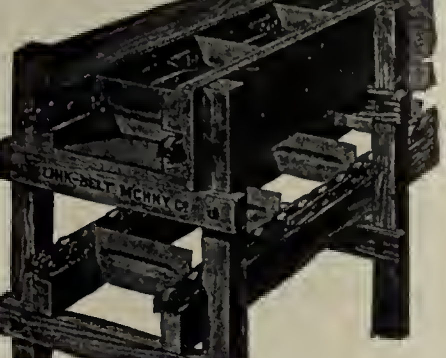

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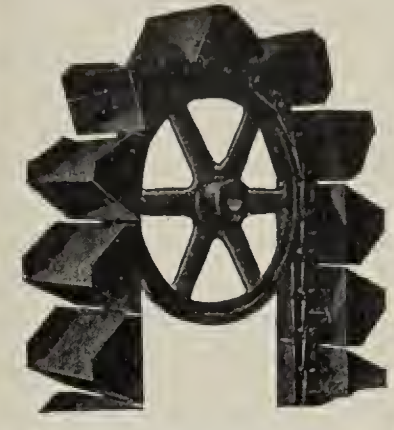

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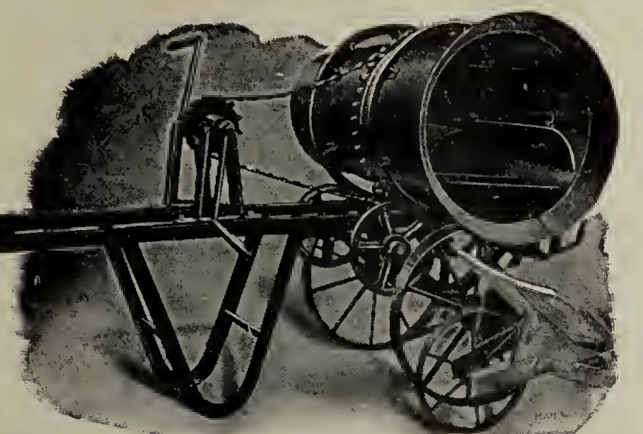

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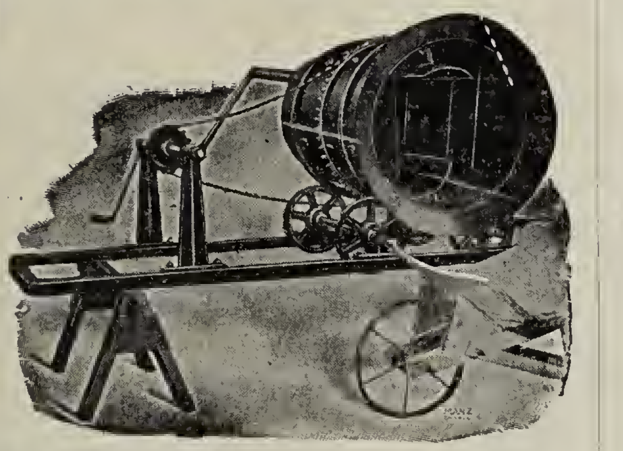

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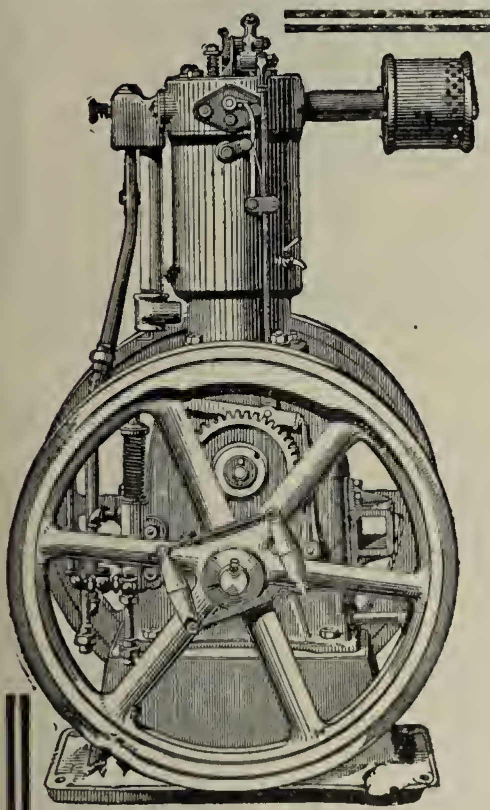

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CEMENT AND ENGINEERING NEWS

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CHICAGO, AUGUST, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE NATIONAL CONCRETE MACHINE MANUFACTURERS' ASSOCIATION CONVENTION.

The above named association was formerly known as the Cement Block Machinery Manufacturers' Association. It held its second annual convention at the Wayne hotel, Detroit, Mich., on August 8-9. Several valuable papers were read and discussed at the meetings. Three of these papers appear in our present issue. The meetings were well attended. A full report of the proceedings will be published by the association.

THE CEMENT SIDEWALK INDUSTRY.

Few people realize the extent of the cement sidewalk industry in the United States. This country leads all others in this class of work. In France and Germany cement walks are the exception rather than the rule. It is otherwise in England, where artificial stone walks have been in use for more than fifty years. They are not laid in place, but are made in the form of tile or plates in factories by hydraulic or other pressing machinery. In Germany and France, asphalt and tar walks are in almost universal use, while natural stone is used in large cities where the traffic is heavy.

In this country cement walks have practically superceded stone or brick, because the cement walk wears better and does not heave under frost, as do the stone walks, which require constant resetting every few years, which makes them expensive in the long run.

Cement walks are now being laid in almost every town, city and hamlet in this country. Many of the smaller towns do their own cement walk laying, usually at the exact cost of materials and labor, while other town authorities purchase cement in car lots and sell at cost to lot owners in order to encourage this class of work, other towns again pay a fixed bonus to private owners for each foot of walk laid, amounting to from 25 to 33 per cent of the cost of the walk. The larger cities let cement walk construction to the lowest responsible bidder. Very large contracts are let in this way. Messrs. Ficken & Stobaugh of New York City have closed a contract for a single stretch of street work, including cement curb and gutter for $250,000. This firm has contracts on their books for this season's work amounting to more than one million dollars. They employ over 800 men and 150 teams. They own and operate 90 steel cars and three miles of removable side track, using the latest labor saving machinery whenever possible to dispense with hand labor.

Public parks and boulevards in large cities call for immense amount of sidewalk work each year. As an example, the South Park Board, which controls the public parks in the south division of Chicago, laid 68,411 square yards of cement sidewalks in 1905. The South Park Board during the last two years has likewise erected a number of cement buildings and swimming pools, cement seats and benches, for which it paid in the neighborhood of $400,000. The work was done by cement sidewalk contractors. The North Side and West Side Park Boards did about $270,000 of cement work in 1905. The city of Chicago and private lot owners expended nearly $400,000 in cement walk construction. A single cement sewer system was let for over $700,000 in Chicago. The town of Gary, Ind., the new city which is being built by the U. S. Steel Corporation, will be constructed mainly of cement. All sidewalks, sewers and street paving will be of cement, as will be most of the buildings on the town site.

The few facts above stated show that there is a vast field of enterprise before the cement sidewalk contractor who possesses the nerve to assume responsibility in large undertakings and good judgment to manage the same with economy to insure satisfactory returns on the venture.

The contractors who are in touch with heavy concrete jobs have, as a rule, acquired reputations for doing good sound work.

The Boston contractors for the concrete work on the new Boston Normal and Latin schools have been indicted on four counts in the Superior Criminal Court of Boston, the charge being that the concrete used did not contain the required amount of cement called for under the specifications for the work. The contractor's foreman and the concrete mixer on the job were likewise indicted, on the same charge. Judge Harris, the presiding judge, has granted a short continuance in the three cases.

DENATURIZED ALCOHOL IN GERMANY.

Twenty-six millions of gallons of denaturized alcohol were produced in Germany in 1903.

Farmers distill their own alcohol from grain, potatoes and other root crops. The farmer sells to the German Speritus Trust at 42 cents per gallon. After the wholesale and retailer's profit has been added the Speritus Trust sells at a price that enables the consumer to purchase at 29 cents per gallon, or 13 cents below the first cost. The German government pays the Speritus Trust a bonus equal to the tax on ordinary alcohol.

Thus the farmer and the consumer both profit by the government rebate.

Wood alcohol is being sold in the United States at 30 cents per gallon by the wood alcohol trust in this country. Denaturized alcohol can be placed on the market in this country at less than 20 cents per gallon, retail, says a competent authority. It will be used for power in alcohol engines, for light in lamps using Welsbach mantles, for mixing paint as a substitute for turpentine, and for many other industrial purposes.

I. H. C. ENGINES AMONG TRADES WORKERS.

There seems to be very good reason why machinists and men of related callings are drawn to the line of small powers manufactured by the International Harvester Co., 744 Monroe st., Chicago. This great company has but recently taken up the building of gas and gasoline engines. Its reputation would not permit it to turn out anything but high-class machines. When put to the test, their engines fully meet all expectations. First of all, they are dependable. That fact will be greatly appreciated by small power users. They cannot all connect with line shifting operated from central stations. Individual steam powers for them are too slow and expensive. The I. H. C. engines furnish ready power. They are reliable. They furnish power at a moment's notice. They stop the instant the work is done, and all expense stops also. They are, therefore, much more economical than steam or other old style powers.

Another important fact is that the I. H. C. engines are adapted to use alcohol as well as gas or gasoline. This enables power users to operate with greater economy than ever, now that the tariff is off denatured alcohol.

The I. H. C. engines are made in

various sizes in portable and stationary horizontals and in uprights or verticals, thus adapting them in size and style to almost any use.

An advertisement of these engines is now running in this paper. Power users would do well to read it and procure the I. H. C. book on the power question before placing orders.

CONCRETE BLOCK ARCHITECTURE.

A. T. Bradley.

The Egyptians were probably the first cement makers, nearly 4,000 years ago, but nothing important was discovered until about 2,000 years later, when the Romans discovered its great value as a building material and found extensive use for it in building their palaces, vaults, etc. The art, however, perished with the Romans, and nothing important in the use of cement occurred until the erection of the famous Eddystone lighthouse, which was completed in 1759.

Upon this wonderful discovery we have by invention found a thousand uses to which cement can be applied, and it is now fashioned into shapes never dreamed of years ago, the wonderful plastic qualities of concrete making it possible to produce any number of different effects, and the finest of ornamental designs can be made at small cost. One of the latest uses to which cement has been put has been the making of it in the form of a building block, and the uses for these blocks cover the whole field of building.

The use of the concrete block as a building material is fast becoming general. Buildings erected of them do not require continual painting and repairing, as is the case with those built of wood or brick. They are cheaper to use and instead of deteriorating from year to year, continue to grow stronger and better with age. Like any other building material, however, they must be handled intelligently, and the real success of the concrete building block depends not only on the way it is made, but also on the manner in which it is used. Good taste is as essential in the erection of a building as good material, and we are all agreed that a concrete block properly made is not only good material, but the best of material. It should, however, be placed in a wall in a manner that is attractive. The great complaint seems to be that a majority of the buildings erected in the past show too much of a sameness in appearance. Where one design of rock face is used throughout it is not at all difficult for the inexperienced eye to detect an artificial appearance. Such buildings do not please the fastidious builder, and he sometimes becomes imbued with the idea that cement blocks will not make a handsome building. We often hear it stated that the architect is not favorable to the cement block, and while this may be true in some cases, it is doubtless due to the fact that the blocks he has been asked to specify were not properly made.

It is true the cement block has had hard treatment from many ignorant makers who have rushed blindly into the business and failed to make good stone. This class of block makers, however, are fast being weeded out, and in their place we find a more substantial class with reputations of their own at stake. These makers will give us good stone, and we as machinery manufacturers must give the stone maker a variety in the way of design.

The cement block generally used has been one made to imitate cut stone, and there has been some strong objections brought to bear on this style of block, one well-known engineer having even gone so far as to say "that in imitating rock face stone we are credited with the most monotonous building material ever produced." This statement, while somewhat harsh on the surface, should nevertheless be taken as a sample of the feeling existing with many prospective builders. The cause doubtless lies mainly with the stone maker, who is satisfied to use one design of face for each size of stone, and as a result the stone he produces has a stereotyped appearance which we can not but admit is far from pleasing. In order to overcome this bad feature we, as manufacturers, should urge upon the stone maker the advisability of using a number of designs, and so place him in a position to put out a variety of faces and not one face to each size.

The architect must also be considered, as he occupies a most important position in the matter, and he alone is responsible for the buildings he designs; therefore, we must endeavor to give him what he wants, even though it means an added expense, as by this means only can we gain his confidence and through him reach the most particular builder. The architect should also do his part by insisting that a variety of faces be used.

Another thing for the block maker to consider is the quality of his sand. Only too often have we seen most attractively designed buildings spoiled by the use of inferior, dirty sand. Some block makers appear careless in this respect, and while they are unusually particular as to the make of machine they will use, they seem to lose sight of the fact that no matter how good the machine may be it can only produce according to what is placed in it. It is pleasing, however, to note that the concrete blocks manufactured this season show great improvement over those formerly made. Scores of handsome churches have been erected. Large factories, warehouses, power houses, etc., are found on every hand, and many exceptionally fine residences can be seen in almost every city.

In one of the leading cities of Connecticut blocks are now being made to be used in the erection of a large handsome theater. Fifty thousand concrete blocks will be required, together with 500 feet of water table and sills. I have it on reliable authority that this is to be the first of a chain of theaters to be built of concrete blocks. All of this goes to prove that we are steadily forging ahead in the right direction. The concrete block is in great demand, and if properly made and intelligently used its success is assured.

The Joliet Concrete Construction Co. of Joliet, Ill., has been incorporated; capital, $25,000. The company will manufacture concrete building materials, contract for the erection of cement bridges, buildings, vule and abutments. The incorporators are A. O. Brown, Robert Morrison and John Strombock, all of Joliet. The company has a large number of orders on its books for work.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JUNE				TWELVE MONTHS ENDING JUNE			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	130,000	$ 491	5,040,000	$14,035	7,161,024	$ 23.510	26,891,580	$ 80,518
Belgium..........	7,109,939	24,011	3.600,019	9,501	156,603,040	506,831	122,845,140	383,449
France...........	1,488,200	5.095	3,778,990	11.334	8.942,399	33,461	12.124,366	41,781
Germany.........	22,807,735	77,607	19,143,812	54,020	206,033.876	697,242	210,660,859	704,766
All Other Europe.	238,097	599	....	....	1,465,598	4,823	8,332	22
British North Am.	56,360	720	40,000	265	271.875	2.125	1,379,200	9.109
Other Countries..	160,000	509	9,244,195	43,825	2.276,324	8.605	19,054,350	82,594
TOTAL..........	31,990,331	$109,032	40,847	132,980	382.754,136	$1,276,597	392.963.827	$1,302,239
Domestic Exports of Cement, bbls.	109,714	$146,588	53,928	$82,203	1,067,284	$1,484,795	809,578	$1,165,161

There were 7,939,436 lbs. of imported Roman and Portland Cement, etc., in the United States bonded. warehouses in June 1905, valued at $27.593, against 5,742,099 lbs. in June 1906, valued at $16,787.

For 12 months ending in June 1905, there were 120,544 tons of asphalten imported in the United States, valued at $538,573 against 74,700, tons imported in 12 months ending June 1906, valued at $317,094.

ADVANCE IN CEMENT TECHNOLOGY, 1905.

BY EDWIN C. ECKEL.

INTRODUCTION.

The statistics presented in the following section of this report can be used as bases for further studies in the condition of the American cement industry. In the present section, therefore, certain points of industrial interest are briefly discussed.

RAW MATERIALS IN USE.

The following table contains data on the production of Portland cement, grouped according to the various combinations of raw material used in its manufacture.

Type 1 includes cement produced from a mixture of argillaceous limestone ("cement rock") and pure limestone. This is the combination of materials used in all the cement plants of the Lehigh district of Pennsylvania and New Jersey, and also at several western plants.

Type 2 includes cement manufactured from a mixture of marl and clay. This type of mixture is used only in the States of Michigan, Ohio, Indiana and New York.

Type 3 includes cement manufactured from a mixture of soft limestone ("chalks") and clay. This mixture is employed at plants in Alabama, Arkansas, Texas and South Dakota.

Type 4 includes cement made from a mixture of ordinary hard limestone and clay or shale. This mixture is employed at many plants all over the United States. In order to prevent publication of individual statistics, the Portland cement made from slag and limestone is included in this group. At present the only Portland plants using a slag-limestone mixture are those of the Illinois Steel Company at Chicago, Ill., and Buffington, Ind.

Production and percentage of totol output of Portland cement in the United States according to type of material used, 1898-1905

Barrels]

Year	Type 1 Argillaceous limestone (cement rock) and pure limestone		Type 2.[a] Marl and clay		Type 3 Soft limestone (chalk) and clay		Type 4.[b] Hard limestone and clay or shale	
	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage
1898	2,764,694	74.9	562,092	15.2	40,120	1.1	325,288	8.8
1899	4,010,132	70.9	1,095,934	19.4	88,200	1.6	458,000	8.1
1900	5,960,739	70.3	1,454,797	17.1	185,686	2.2	880,798	10.4
1901	8,503,500	66.9	2,001,200	15.7	495,752	3.9	1,710,773	13.5
1902	10,953,178	63.6	2,220,453	12.9	373,425	2.1	3,683,588	21.4
1903	12,493,694	55.9	3,052,946	13.7	457,813	2.1	6,338,520	28.3
1904	15,173,391	57.2	3,332,873	12.6	79,500	0.3	7,920,117	29.9
1905	18,454,902	52.4	3,884,178	11.0	235,385	0.7	12,672,347	35.9

[a] Including in the years before 1905 the product from alkali waste and clay at one plant.
[b] Including the product from slag and limestone.

The preceding table, which is a continuation of those which have been published by the writer for a number of years past in Engineering News, shows very clearly the direction in which the American cement industry is trending. Over half of the total product is still made from a mixture of "cement rock" and limestone, but this percentage is slowly decreasing. The marl-clay mixture shows a similar decrease. The proportion of the product made from a mixture of hard limestone and clay or shale is, on the other hand, increasing rapidly.

KILNS AND KILN PRACTICE.

Tables showing the number and types of kilns in use at various dates have been published in this and preceding volumes of Mineral Resources. Omitting vertical or stationary kilns, these figures may be summarized as follows:

Rotary kilns, 1902 and 1905.

	1902.	1905.
Active	456	722
Idle	9	23
Building	46	42

This table shows merely the increase in the number of rotary kilns employed in the American Portland-cement industry during the two years compared. But along with this increase in number there was a marked increase in the rate at which the plants were driven, and in the past few years an equally marked increase in the size of the kiln itself. These factors appear clearly when we compare the output per kiln for the two years: In 1902 each active rotary kiln averaged an output of 36,909 barrels during the year, in 1905 each kiln averaged 48,118 barrels—an increase in kiln efficiency of slightly more than 30 per cent. Part of this increase was due to more steady driving and part to the use of longer kilns. It is probable that during 1906 an average of considerably over 50,000 barrels per kiln per year will be attained.

It may be of interest to determine the total capacity of American plants. Taking into account the number of kilns in use, their sizes, and the raw materials used at the various plants, it is estimated that all the kilns now in operation can produce about 129,000 barrels per day and that before the end of 1906 the total possible daily production will exceed 140,000 barrels.

LOCALIZATION OF THE INDUSTRY.

The present geographic distribution of the cement industry is well shown in the following table. The term East, as here used, includes plants in Pennsylvania, New York and New Jersey, none being located in New England. The "Central" plants are those in Ohio, Indiana, Illinois, Michigan and Missouri. Under West are included Kansas, Colorado, South Dakota and Utah. On the Pacific coast are the three active California plants. The South includes Virginia, West Virginia, Georgia, Alabama, Arkansas, Texas and Kentucky.

Geographic distribution of Portland-cement industry in 1905.

	East.	Central.	West.	Pacific coast.	South.
Number of plants operating	39	32	7	3	7
Output in barrels, 1905	19,589,675	10,723,802	2,470,349	1,225,429	1,237,557
Percentage of total output	55.6	30.4	7.0	3.5	3.5

CONCENTRATION OF INTERESTS.

At intervals an excited and not particularly well-informed newspaper press inveighs against the enormous profits realized by a purely imaginary cement trust. To those acquainted with the highly competitive nature of the cement industry, in its present stage, such denunciations may seem too absurd for denial, but there is reason to believe that they are accepted as true by the general public. It may, therefore, be of advantage to state that there never has been a cement trust in this country, and that at present there seems to be little opportunity for arranging any satisfactory combination of the cement producers. Several years ago a few fairly large companies took up this matter, but as three of the largest plants could not be induced to consider it, the question never reached an advanced stage.

The nature of the industry renders it improbable that any combination or noncompetitive arrangement can be carried through to such a point as to result in a monopoly of the industry and permanently high prices. Good raw materials are so widely distributed throughout the United States that there is hardly a county which could not produce Portland cement if prices were forced high enough. The only limitation now on the erection of cement plants is the fact that they cost too much for an individual or a small firm to enter the business. A plant producing 2,000 barrels per day will require an investment, for land, plant and working capital, of between $1,000,000 and $1,500,000.

Setting aside as impracticable the question of trusts and combinations based on monopoly of raw materials, it can be said that there is noticeable a certain concentration of interests in the cement industry, and that this will probably become more marked year by year. The 88 plants in existence in 1905 are owned by 78 companies, and several of these nominally independent companies are closely connected in ownership.

Of these 78 companies, 15 produced over two-thirds of the entire American Portland cement output. Seven of these showed an annual output of over one million barrels each, and these seven together produced somewhat over half of the entire output of the country. To place the matter in a comparative form, the five largest companies together produced about the same percentage of the American cement output that the United States Steel Corporation does of the American output of pig iron. The cement industry is at present, therefore, in a more concentrated condition than was the iron and steel industry at the date of formation of the Steel Corporation, but further concentration, to such a point as to bring about unfairly high prices, does not seem practicable.

Figures obtained unofficially from various sources would indicate that the total authorized capitalization of all the American Portland-cement companies now in operation will fall between the limits of $110,000,000 and $125,000,000. This estimate takes no account of outstanding bond issues, but, on the other hand, gives no credit for stock authorized but not issued, so that on the whole it can be accepted as representing very fairly the total capitalization of the American Portland-cement industry. This capitalization can not be considered excessive, in view of the fact that it would cost probably $75,000,000 to $85,000,000 to replace the plants and properties now in existence.

STATISTICS OF CEMENT INDUSTRY IN 1905.

BY L. L. KIMBALL.

INTRODUCTION.

The expected bettering of conditions in the cement market came in 1905, and the year closed with a general feeling of satisfaction on the part of conservative manufacturers. Prices were not as high as they had been before the disastrous fall in the market which occurred two seasons ago, but their tendency was upward, the prevailing selling prices throughout the country averaged up so as to show a fair interest on invested capital, and the general condition of trade was indicative of a profitable market during the coming year.

The increase in the output of domestic Portland cement was very large, but it hardly kept pace with the demand, and the year, taken as a whole, showed conclusively the fact that American cements have been successful in practically displacing the various cements imported from other countries. Domestic Portland cements showed in the twenty-four hour and the seven-day tests a greater tensile strength than imported cements, in addition to carrying a larger proportion of sand, which facts have helped greatly in steadily decreasing the demand for foreign brands of cement. In addition, the convenience of buying material already at hand, the avoidance of added cost through ocean freightage and the possibility of deterioration of the cement in the sea air, together with the superior quality of and constant improvements in the cements produced in the United States, have made a condition in the cement world in this country which would have seemed quite impossible ten years ago.

The natural-cement industry in America has declined within the last few years as the Portland-cement industry has grown. In the well-known natural-cement districts many of the plants were idle in 1905, a few were altered with a view to installing machinery for producing Portland cement, some were sold for other uses than the making of cement, and several were torn down. In the Louisville district, where for several years a combine among all the natural-cement producers has existed, most of the plants stood idle, while their quotas were being made by some of the few larger factories that were running, though those mills that were active ran with reduced force and on about half time.

The slag or puzzolan cement industry progressed a little in 1905. A large plant to produce puzzolan cement was completed in Kentucky during the year. This industry grows slowly, but its growth has been fairly steady since 1900, when the product was first reported by this bureau.

At the present time a very interesting demand in the cement industry, and one for which as yet no supply has been produced in the United States, is that for a pure white or absolutely colorless cement. There are a number of deposits of limestone in this country that are practically free from any trace of iron. With the increasing demand for a perfectly white cement for use in joining marbles, for interior finishing and decorations, for taking pale color tints, and for numerous other uses which cannot be set forth here, it is probable that before long such an article will be perfectly produced by American manufacturers.

ACKNOWLEDGMENTS.

It is desired to acknowledge here the courtesy with which requests for data as to statistics of production of cement in the United States are met. There is rarely a year when complete returns are not available, and as the statistics published in this report are taken exclusively from data forwarded by cement producers (where, of course, the figures are relative to United States production only), it will be appreciated that such co-operation is advantageous, both to this bureau and to the people engaged in the cement industry.

Preceding the full report, a preliminary statement of production is annually sent out at as early a date as possible. Early in 1906 a number of requests were received by the bureau urging the immediate publication of this statement for 1905. In this connection the writer, while expressing thanks for much cordial co-operation and many courtesies, wishes to call attention to the fact that it is impossible to issue the statement of production until the figures are all sent in, and to urge upon the manufacturers the importance of responding promptly in order to make practicable the early issue of the figures showing production of cement, which seems to be so universally desired.

PRODUCTION.

The calendar year 1905 is the record year thus far in the gain marked in total production of hydraulic cements in the United States over the preceding year.

The increase is 8,427,051 barrels of cement in quantity and $9,899,613 in value, which statement shows most clearly the great bettering of conditions in the cement industry in this country in 1905.

The total production of cement for 1905 was 40,102,308 barrels, having a value of $35,931,533, as compared with a total production in 1904 of 31,675,257 barrels of cement, having a value of $26,031,920.

The production of Portland cement in 1905 was 35,246,812 barrels, valued at $33,245,867.

The production of natural cement in 1905 was 4,473,049 barrels, valued at $2,413,052.

The production of puzzolan cement in 1905 was 382,447 barrels, valued at $272,614.

These figures will be found to vary somewhat from those given in the preliminary statement of production, which is always liable to correction. The change in this instance is due to an error in figures sent by a company that later corrected their mistake. The values given in connection with the various productions of cement for 1905 are much more nearly normal than those shown in the preceding year.

PORTLAND CEMENT.

PRODUCTION.

The following table shows the quantity and value of the production of Portland cement in the states where this article was manufactured in 1903, 1904 and 1905:

Production of Portland cement in the United States in 1903, 1904, and 1905, by States.

[Barrels.]

State.	1903.[a] Number of works.	1903.[a] Quantity.	1903.[a] Value.	1904.[a] Number of works.	1904.[a] Quantity.	1904.[a] Value.	1905[b] Number of works	1905[b] Quantity.	1905[b] Value.
Alabama	1	....	....	1	....	....	1	....	....
Arkansas	1	....	....	1	....	....	1	....	....
California	3	631,151	$1,019,352	3	1,014,558	$1,446,909	3	1,225,429	$1,671,816
Colorado	1	258,773	436,535	1	490,294	638,167	1	786,232	1,172,027
Georgia	1	....	....	1	....	....	1	....	....
Illinois	5	1,257,500	1,914,500	5	1,326,794	1,449,114	5	1,545,500	1,741,150
Indiana	3	1,077,137	1,347,797	4	1,350,714	1,232,071	6	3,127,042	3,134,219
Kansas	1	1,019,682	1,285,310	2	2,643,939	2,134,612	4	....	....
Kentucky	....	....	....	1	....	....	1	....	....
Michigan	13	1,955,183	2,674,780	16	2,247,160	2,365,656	16	2,773,283	2,921,507
Missouri	2	825,257	1,164,834	2	....	....	2	3,879,542	4,164,974
New Jersey	3	2,693,381	2,944,604	3	2,799,419	2,099,564	3	3,654,777	2,775,768
New York	11	1,602,946	2,031,310	11	1,362,514	1,257,561	11	2,111,411	2,044,253
Ohio	8	729,519	998,300	7	910,297	987,899	8	1,312,977	1,390,481
Pennsylvania	17	9,754,313	11,205,892	17	11,496,099	8,969,206	18	13,813,487	11,195,940
South Dakota	1	....	....	1	....	....	1	....	....
Texas	2	....	....	2	....	....	3	....	....
Utah	1	....	....	1	....	....	1	....	....
Virginia	1	538,131	690,105	1	864,093	774,360	1	1,017,132	1,033,732
Washington	....	....	....	....	....	....	1	....	....
West Virginia	1	....	....	1	....	....	1	....	....
Total	76	22,342,973	27,713,319	81	26,505,881	23,355,119	89	35,246,812	33,245,867

[a] The States combined for 1903 and 1904 are mentioned in the text of the reports for those years.
[b] The States combined for 1905 are given in the text below

State combinations are made in order to avoid the publication of individual figures. Where there is but a single plant in a state or where there is but one plant that was active during a given period, the figures reported are published only in combination with figures showing the total production of neighboring states, unless there is some reason for doing otherwise. In any case where an individual production is given it is with full consent from the proprietors of the plant. In the preceding table the products of Alabama, Georgia, West Virginia and Virginia are combined; those of Kentucky and Kansas are combined with Missouri; and those of Colorado, Utah, Texas and South Dakota are combined. In each case the total product of the states is placed against the name of the state contributing the largest quantity of cement to the entire amount.

In 1905 the state of Kentucky had its first production of Portland cement recorded. In addition to this Washington appears for the first time in the list of cement producers, as the new plant there was practically completed though not put into operation in 1905.

Plans for a Portland cement plant at Mason City, Iowa, are now definitely made, and work on its construction will begin in the spring of 1906. The capacity of the new mill will be about 3,000 barrels of cement per day. There is also reported the formation of the Coos Bay Mining, Milling and Transportation Company, in Portland, Oreg., and its intention to erect a large Portland cement plant in that state. Besides the fact that there is a large demand and, in proportion to the territory, a small supply of cement in the far West, the building of a cement factory in Oregon would be of more than usual interest, because it was in this state that the first attempt in the United States was made to use the rotary kiln or, as it was then (in 1887) called, the Ransome process of burning and grinding cement. The pioneers were called The Portland Cement Company of Portland, Oreg., and their works were located at Oregon City, in Clackamas County. The material used was a natural Portland cement rock found in Douglas County. Gas was the fuel used, and power was furnished by the waters of the Willamette River. This company was eventually disrupted through litigation among the stockholders, and since 1890 no cement of any kind has been produced in the state.

In Wisconsin two new plants are projected for the production of Portland cement, and the plans for them are reported complete, though building has not begun. They will both use marl and clay for their materials.

In considering the states which were the four largest producers of Portland cement in 1905 it will be noticed that although the rank of the second, the third, and the fourth changes somewhat, Pennsylvania stands, as always, at the head of the line. This time, however, her lead amounts to 10,158,710 barrels, her production being more than 39 per cent of the entire quantity of Portland cement produced in the United States. In 1904 Pennsylvania's lead was smaller, being but little more than 8,500,000 barrels, though her share of the total production was 40 per cent. The increase in the total production for 1905 was so great that though her production and her lead over the other states were both increased her percentage of the total production was slightly decreased.

New Jersey retains her place as the second largest producer of Portland cement in 1905, with an output which is larger than the one made in 1904 by several hundred thousand barrels and which amounts to something over 10 per cent of the total Portland cement production.

Indiana, with a production of only about a half million barrels less than made by New Jersey, displaces Michigan (which ranged third in 1904) and stands third in 1905, though in 1904 she was not in place among the first four producers. Indiana's advance is one of nearly two million barrels and makes her percentage stand as 8.87 of the entire Portland cement production.

Michigan ranks fourth, notwithstanding the fact that her production of Portland cement in 1905 was more than a half million barrels in excess of that of the previous year.

Following is a table designed to show the growth and development of the Portland cement industry in this country since 1890. Under the heading of "Section" are the names of the two counties in Pennsylvania which include nearly all the great cement works in the heart of this industry, the names of several of the states that are large or old producers, and the remaining cement-producing states, namely, Alabama, California, Colorado, Georgia, Illinois, Indiana, Kansas, Kentucky, Missouri, South Dakota, Texas, Utah, Virginia and West Virginia, and such other counties in Pennsylvania as have cement plants outside of Northampton and Lehigh counties.

The tables for 1890 and 1900 include Warren County, N. J., with the two above mentioned counties in Pennsylvania, and, as the New Jersey county is a part of what has for many years been known as the Lehigh district, this was a proper inclusion at that time. But in 1903 the state totals showing production of Portland cement had become so large that it was thought best to make a separation of the three counties in accordance with the states to which they belong. This course has been followed in the succeeding tables as well.

Development of the Portland-cement industry in the United States since 1890

[Barrels]

Section.	1890 Number of works.	1890 Quantity	1890 Percentage	1900 Number of works.	1900 Quantity	1900 Percentage
New York	4	65,000	19.4	8	465,832	5.5
Lehigh and Northampton counties, Pa., and Warren County, N. J.	5	201,000	59.9	15	6,153,629	72.6
Ohio	2	22,000	6.5	6	534,215	6.3
Michigan	.....		.....	6	664,750	7.8
All other sections	5	47,500	14.2	15	663,594	7.8
Total	16	335,500	100.0	50	8,482,020	100.0

Section	1904 Number of works.	1904 Quantity	1904 Percentage	1905 Number of works.	1905 Quantity	1905 Percentage.
New York	11	1,362,514	5.1	11	2,111,411	6.0
Lehigh and Northampton counties, Pa.	15	11,411,620	43.1	15	13,713,910	38.9
New Jersey	3	2,799,419	10.6	3	3,654,777	10.4
Ohio	7	910,297	3.4	8	1,312,977	3.7
Michigan	16	2,247,160	8.5	16	2,773,283	7.9
All other sections	29	7,774,871	29.3	36	11,680,454	33.1
Total	81	26,505,881	100.0	89	35,246,812	100.0

THE PORTLAND CEMENT INDUSTRY BY STATES.

Alabama.—The production of the single factory which manufactured Portland cement in Alabama during 1905 was larger than that of the preceding year by more than a third of the entire quantity, notwithstanding the fact that the mill was closed down for about three months for improvements and repairs. The plant for manufacturing Portland cement that is to be built at Epes, having offices at Selma, is still in embryo, the company not yet having begun construction. The deposit of limestone to be utilized by this company is practically the same as that at Demopolis, where Portland cement has been successfully made since 1902. The Standard Portland Cement Company, of Charleston, S. C., has purchased property at Leeds, on the Southern Railway, 17 miles from Birmingham, and will begin erection of a Portland cement mill there immediately. The company owns about 300 acres of land bearing limestone of the Trenton formation. The plant will be completed in 1906.

Arkansas.—This state has but one cement plant, that at White Cliffs, which was closed during 1905, and has gone into the hands of a receiver.

California.—There is a great and constant demand for cement on the western coast, and California is rapidly growing in ability to supply it. In 1905 the three plants already established in the state were active and produced an output which was in advance of that for the preceding year. One of these plants was somewhat hampered by a shortage of water power, which necessitated several weeks of idleness, and another was closed down a short time for repairs; but the year's work averaged well. The erection of a large plant in southern California, at Davenport, near Santa Cruz, is the outcome of the demand for American cement in California and the Far West. The new organization is the Santa Cruz Portland Cement Company, and several of its officers are also officers and stockholders in the Standard Portland Cement Company, whose plant is at Napa Junction. The new factory will be operative early in 1906. It will have 12 kilns, each 125 feet by 8 feet. The mill site is near the ocean, and a pier will be built in order that shipments of cement may be made by water as well as by rail. The tract of land owned by the company at this point contains more than 200 acres of limestone, and the deposit runs to 500 feet in height. There are also about 300 acres of shale in the holdings. In this plant oil will be used for fuel, and power will be brought from the Sierra Nevada Mountains.

Colorado.—There was but one cement plan active in Colorado in 1905, and its output was about a third larger than that made during the preceding year. Two additional rotary kilns, 8 feet in diameter by 125 in length, are now being installed. When this is completed, the plant will have a capacity of 2,200 barrels of cement per day. The alterations and improvements are now in progress, and the company expects to complete them entirely and to put the new kilns in operation by early fall in 1906. One other company incorporated for the manufacture of Portland cement is reported from this state, but as yet it has not erected a plant. The offices are located in Denver.

Georgia.—The one Portland cement plant in Georgia was active during the entire year in 1905. About the same quantity of cement was made as formed the output for the preceding year, but owing to the prevalence of better prices in 1905 it was worth almost half again as much as that made in 1904.

Illinois.—With the exception of an advance in the production of each of the Portland cement producing factories over their output for the previous year, there was little difference in the record of Illinois for 1904 and 1905. Of the four active Portland cement plants, one was idle for two months for repairs, one ran on full time, and one was closed for three months while improvements, additional machinery and repairs were put in. The fourth company, which makes slag as well as Portland cement, ran its factory for the production of Portland cement through the entire year and had an output in advance of that for the preceding year.

The Illinois Steel Company will turn over the management of its cement plants to the Universal Portland Cement Company, a constituent company of the United States Steel Corporation, which will continue the business formerly handled by the cement department of the Illinois Steel Company. Mr. Hagar, former manager of this department, will be president of the new company. The new plants at Buffington, Ind., and at North Bessemer, Pa., which will also be included in the new company, will be completed in the summer of 1907. When they are active, the entire capacity of the Universal Portland Cement Company will be 16,000 barrels of Portland cement per day.

A Portland cement company, having its home offices in Ohio, states that it is beginning the construction of a factory at Dixon, Ill.; that the new mill will use limestone and clay as its materials, and will have a capacity of 2,000 barrels of cement per day; and that the plant will be operated at least in part by water power.

Indiana.—The Portland cement produced in this state in 1905 was made by five plants, two of which were mentioned in the report for 1904 as about to be put into active operation. The Buffington plant, built by the Illinois Steel Company, of Chicago, had its initial run in 1905. A new plant having a capacity of 6,000 barrels of Portland cement per day, located on land adjoining that of the operative cement plant, is now being built by the Illinois Steel Company at Buffington. The present plant has a capacity of 5,000 barrels per day. The mills were continuously active throughout the year. The factory at Bedford was started early in the year, and had a very successful run. These mills had an exceedingly satisfactory beginning. The plant at Mitchell ran on full time the entire year and produced an output which was in excess of its yield for the preceding year by more than a half million barrels. The two other factories which produced Portland cement in this state during the year are located in the northeastern part of the state, and have had successful productions since they first became active. The output of each for 1905 was considerably in advance of that for the previous year. One ran on full time all the year, and the other was only closed down a short time for necessary repairs. The increased demand for Portland cement has caused a decline of such proportions in the production of natural cement in this country that some of the companies that have heretofore had plants equipped solely for making natural cement are turning their attention to the manufactunre of Portland. In some instances there is preparation to add the machinery necessary for the latter production and to continue the former as well, while in others the producing of natural cement will be entirely abandoned, and the buildings will be utilized for the installation of machinery for the making of Portland cement only. In the Rosendale, Cumberland and Louisville districts such changes are being made. Indiana inaugurates the erection of a new Portland plant adjoining the old natural plant, in the Louisville district, at Speeds. The Speed Portland mills are the first to be erected here, and the success of the factory will mark many changes. Two kilns, 100 by 7 feet, each having a capacity of 350 barrels of cement per day, have been set up. There are also the usual crushers, driers, tube mills and kominuters, and in the coal plant there is a Cummer drier, with Smidth ball and tube mills. Power is furnished by a 900-horsepower, Hamilton cross-compound Corliss engine, which drives the raw grinding machinery, the kilns and the clinker mills. The preliminary crusher and pan-mill, as well as the coal grinder, are driven by a separate 150-horsepower engine. Although the plant as it now stands it not an exceedingly large one, it has been planned and built with a view to readily increasing its capacity, if the results justify such extension. The buildings and all foundations laid to carry heavy machinery are constructed of solid concrete made with natural cement from the plant adjoining. None of the other projects for the erection of Portland cement plants in this state reported in the preceding year have taken an active shape in 1905. One plant, which was nearly completed in 1904, is still unfinished, and no new work is now being done on it. There is a new plant being erected at Kimmel, in the northern part of the state, on which work is being rapidly pushed. It will be completed during the summer of 1906, and when ready to be started up will have two kilns 100 feet long and 7 feet in diameter installed. Marl and clay will be the raw materials used. The holdings of the company at present include a number of lakes and marshes extending over about 700 acres. The purpose of this company is to attempt the production of a white Portland cement to be used in art construction. The name adopted, the Art Portland Cement Company, is indicative of this purpose. The new company has no connection with a company of similar name which was in existence a few years ago in Ohio, but which went out of business in 1900.

Kansas.—The growth of the Portland cement industry in Kansas has been very marked within the last five years. Up to 1900, when the Iola plant made its first production, only natural cement plants existed in the state. In 1904 the Kansas Portland Cement Company began operations, and in 1905 two new plants were started late in the fall and winter. The new plant at Neodesha consists of a 40 by 56 by 30 foot crusher building; a drying and mixing building 106 by 47 by 42 feet; a raw grinding building 146 by 80 by 25 feet, which is equipped with ball and tube mills; a finished grinding building 96 by 96 by 25 feet, in which are more ball and tube mills; a kiln building 162 by 96 by 25 feet, wherein 6 rotaries 70 by 7 feet are installed; a boiler building 80 to 40 feet; an engine building 100 by 50 feet, in which are two Corliss engines; an electric lighting engine with generator attached, and two friction clutches, which will carry either half of the mill separately; storehouses 124 by 50 feet and 120 by 65 feet, besides storerooms, office buildings, motor and fan buildings, blacksmith shop, powder magazine and a building for exploder, cap, and fuse—all made of steel construction covered with galvanized iron. The stone is conveyed from the quarries to the plant on two overhead tramways and tracks, approximately 100 feet long. The capacity of the mill is about 2,000 barrels of cement per day.

The new plant at Independence, which was put into operation late in the fall of the year, used all of its six large rotaries for a short but very satisfactory run during the remainder of the year.

There is a new plant reported to be in process of construction at Table Mound, near Independence. Natural gas is the fuel used in all the Kansas plants.

Kentucky.—The new plant for the manufacture of Portland cement, which was completed and made its initital production in this State late in 1905, started out very successfully. This factory is the first one ever erected in Kentucky for the production of Portland cement. There is a plan reported which projects the erection of a Portland cement plant near Staunton, Ky., where a large deposit of suitable rock is said to have been found.

Michigan.—Portland cement in 1905 was made by 13 plants, as in 1904. Of these plants nearly all were idle through some part of the year, which possibly accounts for the fact that the increase in total production for the State over its output for the preceding year is but little more han a half million barrels. Two plants were idle to admit of enlargements and one was closed down while the 60-foot kilns already installed were removed in order that new kilns 100 fete long might replace them. Another plant was so thoroughly reconstructed that half the year was taken up with the improvements, and the mill was not started until late in July. Two plants were closed for a time because of the weather; one by reason of a full stock house; two for minor repairs, and one company went into the hands of a receiver. The new plant at Bellevue was started in September and was successfully operated the rest of the year. In addition to the 13 active plants, there were two that were idle all the year, two that were not under construction at any time, although when work was stopped on them both were more than half completed, and one that was so nearly finished it will be ready to become active early in 1906. One company dissolved and its holdings sold; three were reported as being still "incomplete" and four plants projected at different places were recorded as still only projects. The cement mill at Hecla, after standing idle for nearly three years, has been purchased and will be reopened, overhauled, and operated again in 1906. All told, there were 25 companies reporting from this State for 1905.

Missouri.—There were two active Portland cement plants in Missouri in 1905; both of them were very successful producers and made outputs which in each case ran far ahead of that manufactured during the previous year. The plant at Louisiana was not completed, but will probably become active in 1906. There is also a new factory, located just outside of Kansas City, Mo. It was practically ready to commence operations at the close of the year and will be a producer in 1906. The present capacity of this plant is about 1,000 barrels per day, and it was constructed with a view to enlarging. Up to the early winter of 1902, when the plant in St. Louis made a comparatively small output of Portland, no cement of any kind had been produced in Missouri. The plant at Hannibal had its first production in 1903.

New Jersey.—In this State the entire production of Portland cement, which is second only to that of Pennsylvania in quantity, is manufactured by three plants. All three of the plants ran constinuously through 1905, and each one manufactured a quantity of cement largely in advance of its production for the preceding year. The most marked advance in quantity was made by the factory at Stewartsville.. In 1905 this plant had its most successful production, and the year was unmarked by any serious disaster at the mills.

New York.—In 1905 there were nine cement plants in New York that made Portland cement, and of these but one had also a production of natural cement. Another plant was being altered so as to admit of a production of a high-grade Portland especially adapted for use in the manufacture of artificial stone, in connection with its production of natural cement. One plant was sold, but not operated in 1905. Of the eight factories that produced only Portland cement, seven ran ahead of their 1904 output, some by a large percentage and some by a smaller. One mill made more than five times as much as it produced the year before; one made about three times as much, and two more than doubled the quantity. All of these plants were shut down from periods varying from ten days to three months, either by reason of slight overproduction or on account of bad weather or for repairs. The land on which the Wayland Portland cement plant was built has been sold since the burning of the factory, in December, 1904. The natural cement plant at Jamesville has been purchased by a company owning and successfully operating cement mills in another county of New York State, and it is its present intention to build eventually a large factory on the Jamesville place for the purpose of manufacturing Portland cement.

Ohio.—There were eight factories producing Portland cement in this State in 1905, and the total output ran ahead of the production for the preceding year by more than a quarter of a million barrels. Three of the plants were idle but a few weeks; two were idle about a third of the year for repairs and improvements; one was idle two months while alterations were being made; one was shut down for a short period because of high water, and one was inoperative half the year while new engines were being put in place. One plant, which has been idle for several years, was sold and may become a producer of Portland cement again in 1906. In spite of the idleness of the plants the total State production of Portland ran ahead of the million barrel mark for the first time in its history.

Pennsylvania.—This State, which has always been the center of the Portland cement industry in the United States, had a large output in 1905, as the result of the eighteen active cement plants. One new factory was not started until late in the summer, but it finished the year with a remarkably large output for the initial run. Several of the mills were shut down a few weeks for repairs and one plant suffered from a scarcity of water. Another of the larger factories was idle several months making alterations; but the majority of the plants report a record of full time for the entire year. The general prosperity of the Portland cement industry in this country was indicated in this great center, for the entire State production ran up to nearly 14,000,000 barrels, while prior to 1905 its largest output was less than eleven and a half million barrels. There are several plants which are expected to become active in 1906. Several new companies have been organized, and one, which is backed by California capital, has purchased land and is ready to begin erecting a factory.

The Universal Portland Cement Company, which will take over all the cement plants of the Illinois Steel Company, will build a plant for the manufacture of Portland cement at North Bessemer, near Pittsburg. Work on this plant will begin at once. The material used will be slag from the works of the Carnegie Steel Company, and limestone. The plant will have a capacity of 4,000 barrels per day, and will be known as the Carnegie Cement Plant.

South Dakota.—There is but one Portland cement plant in this State. In 1905 the mill was continuously active. The installation of new machinery and the remodeling of the plant that was successfully accomplished during the preceding year was apparent in the quantity of cement produced this year, as it was increased to more than four times the amount of any output heretofore reported from this mill. The project for a second plant in South Dakota has not yet advanced to the erection of a mill, though it is reported as by no means abandoned.

Texas.—There are three Portland cement plants in Texas, one of which has also an equipment for producing natural cement. In 1905 this factory and the remodeled plant at Dallas produced all the cement made in the State, the Austain plant remaining idle throughout the year. Of the two active plants, one ran continuously through the year and produced an output which was considerably in advance of that made in 1904, and the other was shut down for a couple of months, during which time the machinery was repaired and some alterations were made. Nothwithstanding this lapse the output from the mill was many thousands of barrels in advance of that produced during the previous year.

Utah.—In 1905 the single Portland cement plant in Utah had its largest production, the figures reported for the year showing a decided advance over those giving the production for 1904. The plant was active during the year except a brief stoppage for overhauling. There are two new projects reported from this State for the building of Portland cement plants during the coming year. One plant is to be erected by the Rocky Mountain Portland Cement Company, near Salt Lake City, and the other is to be located at a town that was formerly called Croydon, on the Union Pacific Railway, 28 miles east of Ogden. The name of this town has recently been changed to Portland, because of the decision of the United Pacific Portland Cement Company to locate its new plant there. The three rotary kilns to be installed are 8 feet in diameter by 150 feet in length, and are the largest boiler plate kilns in the world. The kilns at the Edison factory in New Jersey are of equal size, but are made of cast iron. The tube mills in the new Utah plant are also of a much larger size than usual. Powdered coal will be the fuel used in the rotaries, and the output from the three kilns is expected to be 2,000 barrels of cement per day. A modern electric plant is part of the equipment of the plant, as is a steam shovel, with which all the raw material will be handled. The company owns over 2,000 acres of land. The plant is expected to be ready for operation early in 1907.

Virginia.—The single Portland cement factory in Virginia has always been a successful one. Its first output was made in 1900, and since that time the number of barrels of cement produced has been increased each year, so that the record shows a marked and steady advance. In 1905 it ran ahead of its production for the previous year, as usual, and was only idle two weeks for repairs. The mill has nearly a 2,000-barrel capacity. There is a plant projected in this State by one of the successful companies now producing cement in the Lehigh district, but no buildings are yet erected.

Washington.—The Portland cement plant for this State, which has been projected for several years, is now an accomplished fact. It was practically completed in 1905, and will be put into operation during the first half of 1906. As soon as this is accomplished, the plant will at once put in more rotaries and increase its producing capacity. For its initial run two 100-foot rotary kilns have been installed, and those to be added will be equally large. The entire plant has been built with a view to a gradual increase in size until the full capacity of power is utilized, at which

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time the production of Portland cement will have reached 3,000 barrels per day. Power is furnished by water brought from Baker River, across which a dam has been built. A flume 6 by 10 feet, and 14,700 feet in length, conducts the water to the factory. Crude oil will furnish fuel for the rotaries and driers, and limestone and shale will be the materials used for making cement. The factory is built at the junction of the Skagit and Raker rivers, 45 miles east of Anacortes, and is within 1,500 feet of the lime quarry and 300 feet of the shale beds, both of which materials are brought to the mills by means of electric motors. The Great Northern Railway runs through the factory site, thus insuring shipping facilities. The ample opportunity for cement plants in the Northwest was shown during the last year by the shortage in Portland cement, which was so great that coast contractors were obliged to send as far east as Kansas for enough cement to finish buildings already started. There is a plan reported for the building of a cement plant on one of the islands north and west of Washington and included in the State lines.

West Virginia.—As in 1904, there was but one active Portland cement producing plant in this State in 1905. This factory was idle several months, repairing and remodeling. There is to be a new plant built at Martinsburg which will have a daily capacity of 2,000 barrels of Portland cement, but it will not be completed before the end of 1906.

NATURAL CEMENT.

The decrease in the natural cement industry continued in 1905, and the total production fell below that of the preceding year, as it has done for several years. Many plants in the natural cement manufacturing districts were not put into operation during the year, and some were started up simply to make a small quantity of cement for use by the owners of the plant. Several natural cement mills have been torn down and the land on which they stood sold for other purposes, and a few have been made into lime kilns. There was but one new plant built during the year for an exclusive production of natural cement. The decline in this industry seems to be permanent.

PRODUCTION.

In 1905 the total production of natural cement in the United States amounted to 4,473,049 barrels, having a value of $2,413,052. This decrease of 393,282 barrels, as compared with the production of 1904, is not so large as the decrease shown in a comparison of the product of natural cement in 1904 with that manufactured in 1903. The demand, however, seems to be mostly for Portland cement, and reports from the various manufacturers of the natural product show little indication of any strong revival of a demand for this variety of cement, though the falling off in quantity seems to be checked a little.

Following is a table showing the quantity and value of the natural cement made in the United States in 1903, 1904 and 1905:

Production of natural cement in 1903, 1904, and 1905, by States.

[Barrels]

State.	1903			1904			1905.		
	Number of works.	Quantity.	Value	Number of works.	Quantity	Value	Number of works.	Quantity	Value.
Georgia	2	80,620	$44,402	2	66,500	$37,750	3	89,167	$51,040
Illinois	3	543,132	178,900	3	360 308	113,000	3	368,645	116,549
Indiana	....	....		13	735,906	367,953	12	527,600	211,040
Kansas	2	226,293	169,155	2	210,922	79,456	2	230,686	110,750
Kentucky	15	1,533,573	766,786	2	264,104	132,052	2	207,500	83,000
Maryland	4	269,957	138,619	4	65,000	32,500	4	55,324	28,694
Minnesota	2	175,000	78,750	2	138,000	65,620	2	115,314	57,643
Nebraska	....	....	....	1			1		
New York	20	2,417,137	1,510,529	19	1,911,402	1,138,667	16	1,926 837	1,332,809
North Dakota	1	....	....	1			1		
Ohio	2	67,025	46,776	1			1	64 791	51 235
Pennsylvania	7	1,339,000	576,269	5	770,897	298,533	5	748,057	306,555
Texas	2	....	....	1			1		
Virginia	2	47,922	25,961	2	93 292	59,619	2		
West Virginia	1	....	....	1			1		
Wisconsin	2	330,522	139,373	2	250,000	125,000	2	139,128	63,737
Total	65	[a]7,030,271	3,675,520	61	[a]4,866,331	2,450 150	58	[b]4.473 049	2 413,052

[a] The States combined for 1903 and 1904 are noted in the text of the reports for those years.

[b] The States wherein the cement product was combined with that of some other State for 1905 are given in the text below.

In making these combinations, which are necessary in order to avoid disclosing individual productions, the same States have been grouped together for 1905 that were combined in 1904. North Dakota, which has but one plant, has been recorded in combination with Minnesota, Ohio with Virginia, and Texas with Kansas. As before, the totals are placed against the name of the state contributing the largest quantity to the whole amount.

New York stands at the head of the natural cement production, as always, and again is the only State to exceed a million barrels of this cement in its production.

(To be continued.)

LINK-BELT COMPANY.

This is the new name of the firm comprising the Link-Belt Machinery Company of Chicago, the Link-Belt Engineering Company of Philadelphia and the Ewart Manufacturing Company, Indianapolis.

The Chicago concern which was established in 1880, and opened a branch office in New York in 1882, has bought both of its associate companies.

The Philadelphia firm was organized in 1888 and took over the Eastern territory of the Link-Belt Machinery Company, and has continued in the manufacture of the same kind of conveying machinery. Both concerns, however, secured chains from the Ewart Manufacturing Company of Indianapolis, which has all along confined itself to its manufacture—the original "Ewart" detachable link-belting being one of its principal lines.

The plants will be operated at their present locations, which gives to the new company three splendid equipments.

The officials of the new company are:

James M. Dodge, Philadelphia, Chairman of the Board.

Charles Piez, Philadelphia, President.

Glen. G. Howe, Indianapolis, First Vice-President.

Staunton B. Peck, Chicago, Second Vice-President.

S. Howard-Smith, Philadelphia, Treasurer.

P. G. Reid, Philadelphia, Assistant Treasurer.

Dyke Williams, Chicago, Secretary.

Edw. H. Burr, Philadelphia, Assistant Secretary.

The Madusa Waterproofing Compound, manufactured by the Sandusky Portland Cement Co., has been on the market for about two years and has been extensively used in large as well as small jobs of concrete work where waterproofing has been required, meeting with unqualified success. The Madusa Waterproofing is now in more extensive use than any other on the market.

Certain consumers are purchasing it in carload lots. This cannot be said of any other waterproofing compound before the American public. Concrete work carrying as low as one per cent Madusa Waterproofing, absolutely rejects water. It has been found proof against 80-pound pressure in high-grade engineering tests.

Descriptive pamphlets giving full instruction as to its use may be had on application to the Sandusky Portland Cement Co., Sandusky, Ohio.

The Iola Portland Cement Co. is erecting a new plant five miles south of Fort Worth, Texas. Two carloads of machinery have arrived at the mill site. A town known as Cementville will be built on the company's land. The International & Great Northern Railway is building south that will pass through Cementville.

ORNAMENTAL PRODUCTS.

By E. C. Harter.

Concrete or cement stone may be made in almost any ornamental or architectural designs by various methods.

It may be cut as other stone or marble is cut by the stone carver, cast in sand, or moulded in various wood, composition, rubber or iron molds.

The sculptor or stone carver can, without doubt, produce finer and more elaborate work than is possible by casting or with molds of whatever description, and while I believe that there will be call for hand-carved concrete stone in the future, at present those wishing to invest the amount of money necessary to produce this class of work prefer to use natural stone, granite or marble.

Casting cement stone in sand is a simple and practical method where the operator has the ability to mold and draw patterns.

It is the best that patterns be of metal and nicely finished, the same as those used in an iron foundry. By using various cores or fillers, cut underwork may be made by this method. It is necessary to use a mixture having sufficient moisture to admit of pouring.

The stone made by this process is of good quality and has a fine surface.

Rubber or plastic molds—On account of the slow setting of cement it is not practical to cast concrete stone in gelatine molds or glue molds as plaster of paris is cast, but I have seen very nice work made in rubber molds that are vulcanized on to the desired pattern and encased in a perfectly fitting metal form to hold them in place until the concrete is sufficiently set to admit of removal. The rubber seems to cleave freely from the cement and very elaborate stone may be gotten out this way.

By far the most economical method of making ornamental work from concrete is to use metal molds. Very nice designs are possible by this method. The models from which the patterns are made must be gotten out by an architectural molder in clay.

The detail may approach very nearly those of the stone carver, but cut under work must be avoided, unless fillers are used, which is possible in some cases.

Basing an estimate on the cost of ornamental stone on labor at $2.00, cement $2.00 and sand $2.00 per yard, the cost of a renaissance baluster post made in a metal mold is about ten cents, while the cost of them by hand in natural stone would be $10.00 each.

In the past stone of this class had only been found on the boulevards and finest residence streets while in the future with the help of concrete this class of work will be used in the medium and even low priced buildings.

The virtues of concrete should put it in a class by itself. It should not be called artificial stone. It is stone, and of a better and more lasting quality than the average natural product.

The cheapest cut stone is what is known as rock-face or pitched. It seems this is the style the manufacturers of stone machines have been called upon to imitate, and while it is the easiest to make from natural stone it is the hardest to imitate with molds.

Although the patterns may be made directly from natural stone the concrete will have the molded effect which is disappointing.

Real rock-faced or pitched stone may be made from concrete by making the face of sufficient thickness, of fine material, and when well cured, pitch it with stone cutters' tools. This will produce the desired effect, but will leave the surface more porous than the molded products.

Beautifying cement stone by mechanically finishing the surface has not had the attention of the artisans that it is worthy of.

Some very fine laboratory specimens of polished work have been produced, but I find that by exposing them to the elements for only a few days the luster or highly polished surfaces changed to a dull finish.

I firmly believe that this is the result of the continuation of the chemical action of the cement in the mass, and is caused by further crystallization. All of the specimens of this work that I have seen have been upon newly made samples.

Should the highly polished surface be produced on stone that is thoroughly cured there is no reason why it should not retain the polish.

When the progress that has been made in the manufacture and use of cement stone during the last five years is taken into account, those engaged in this, one of the already greatest industries, have reason to feel encouraged or even optimistic.

Every season cuts of lumber necessary for the thousands of buildings constructed in our country raises the price of that commodity and unless the production of concrete stone increases in a greater ratio than the timber decreases we will surely be afflicted by a lumber famine in the comparatively near future.

The advancement towards practicability and beauty in concrete stone which is now generally admitted to be the most durable of building materials, lies almost entirely in the hands of those who are engaged in the manufacture of stone machinery, and from past results I am satisfied that the building public appreciates what is being done along these lines.

CAST STONE.

Artificial stone according to the process of manufacture may be classified under two heads, cast stone and moulded stone. Both of these have advantages and perhaps disadvantages. The more common method of manufacture and that which is followed by those using machines sold by the majority of the members of this association is what I have styled moulded stone, in which the material only slightly moist is shaped in cast iron moulding machines. While it is possible to have a great deal of discussion as to the quantity of water used, it is absolutely necessary to have the material sufficiently dry so that the block can be removed immediately from the machine.

All attempts to make poured stone until recently were by pouring the material into rigid moulds. This left the stone badly honeycombed and the appearance was such that it was unfitted for a high class building stone. An objection was raised by our well known writer that in poured stone you first poured it into the mould, then sat down and waited for it to harden before removing it from the mould. Recent improvements have overcome all these objections, as six men will make at least one thousand two-foot stone, 4x6, requiring but ten or twelve moulds, in a day. This includes the mixing of the material and piling of the stone. After the stone are moulded they require no more care, as we never sprinkle or wet the stone after it is made under this process.

The writer does not wish to condemn what is known as the dry process, as there is no question but that a good durable stone can be made under the dry or tamped process, the writer having furnished stone for at least one thousand buildings in Michigan during the past 25 years under this process, and to the best of his knowledge the stone has given perfect satisfaction so far as the durability is concerned. Quite a number of these buildings for which the writer furnished the stone were colored either brown or red, and in no instance has there ever been a complaint of the stone fading in color or efflor-esence appearing on the same. We have recently heard many complaints from manufactured stone under the dry process of the stone discoloring or fading, and it is generally laid to the cement or the coloring material used. I dare say the trouble lies entirely in the manufacture of the stone and the method of curing the same. To prevent the stone from discoloring or fading no more water should be used in wetting the stone than will disappear in the stone at once. The writer, some 25 years ago, had trouble with stone, the efflorescence appearing on the face of the stone. This invariably occurred where the stone were paneled or ornamental faced, on which the water was allowed to remain until it gradually soaked into the stone or evaporated. We found by taking a sponge and removing all the surplus water from the stone immediately after it was wet we entirely overcame these objections.

I would say that in the making of colored stone too much care cannot be taken in selecting your coloring material. The writer has had but little experience in coloring stone except red or brown. There recently appeared in some of the journals an article from an engineer saying the only way to imitate Bedford stone was to use yellow ochre. This is entirely unnecessary, as you can produce a perfect imitation of this stone by using the proper aggregates without any coloring at all.

Under the wet process, during the past three or four years, this stone has been used in the construction of over $10.000,000 worth of buildings, including some forty banks, eight or ten libraries, many fine flat buildings, churches and residences, among the latter of which we might mention Secretary Root's new residence at New York. Quite a number of factories employing this process have been using imported cement, not that it was superior to the American cement, but that they were sure of getting it well seasoned, and we all know that a cement that has been aged is far superior to fresh made cement for high class work. We all know, too, how difficult it is to get cement properly aged, as the manufacturers find it impossible to supply the market with cement, and so ship it fresh from the mill, as this cement gives entire satisfaction for ordinary concrete work in which the majority of the cement goes. The writer believes it is not necessary to use the imported cement, as by washing fresh cement, which is easily done under the wet process, much is done to overcome the objections to using a fresh cement, and the writer believes that many of the objections raised to the cement by the manufacturers of stone are due largely to their not knowing how to manipulate or meet the conditions which they have to meet. As the work turned out does not come up to the standard we expect, the first thing the manufacturer of the stone does is to lay the blame on the cement. The writer himself will plead guilty for this, for he knows of two instances where he condemned cement when the fault was not with the cement. We once condemned a carload of cement because at the end of a week the stone did not crystallize, and in pitching it off or rock facing it it did not have the life and appearance of the cement we had been using, but at the end of four weeks we found this cement equal to any we had ever used. We have had other cement fresh from the factory, and we found that the stone would be quite warm at two or three days old. The writer believes that if this cement had been properly washed and mixed some time before using that this objection would have been entirely overcome. The great objection to this cement was that it crazed or hair checked. The writer does not claim that the washing of the cement will entirely overcome this objection, but from our experience along this line we are sure that it will do much toward overcoming it. We are now having tests made by the cement manufacturers of the materials we wash out of the cement and one of them has reported that as far as they have gone with their analysis they find that it consists of nothing but fresh lime. The writer believes that if we do our part to overcome the objections which are raised to the manufacture of cement stone as well as the cement manufacturers have done theirs it will only be a short time before every objection that can be raised to a made stone will be eliminated. As Mr. Jones of Brickland, N. Y., one of the oldest manufacturers of stone in this country, has well said, "To be a cement worker you must be a cement doctor," and we must learn to overcome every objection which is now being raised, and not look to the cement manufacturers to do what we should do ourselves. The writer does not believe that there is a cement to-day on the market that will effloresce or discolor if it is properly handled.

The cement manufacturer has chemists and experts to look after every department, while we as stone manufacturers have gone on to the market and interested in the stone business doctors, lawyers and preachers, many of whom have failed in their own profession, and are sure to make a failure of the stone business. I can state on instance where a party I interested in the manufacture of stone insisted upon the use of a magnesia lime stone for facing. I assured him that he would fail, and went so far as to refuse to sell him if he insisted upon using the material. He promised not to use it, but afterwards used it in one building, and naturally the work was not at all satisfactory. There is no lime stone that the writer knows of that will not weather good that will make a good artificial stone, such stone, for instance, as was used in our court house in Chicago, which in a few years badly disintegrated and went to pieces. This does not hold good with sand stones, however, as the writer some 20 years ago used sand stone for facing of stone that would disintegrate and go to pieces in its natural state, and now this stone after 20 years of use is as perfect as when first used. We should all remember that we are in practically a new business. There is much to learn, and while nearly all industries, if not all, are taught in the schools and the businesses established by men well versed along their lines, we have no schools to teach us the manufacture of stone except the school of experience. I believe such meetings as we are holding here now for the exchange of ideas will do much to establish the business, and those that go into it and follow out the well laid down rules of the parties selling the machines will succeed while others will fail.

In describing concrete block machines the other day John N. Rauber, a well-known contractor of Rochester, N. Y., said:

"Simplicity of construction is essential.

"A machine with complicate mechanism is apt to break one of the parts at any time, completely stopping the work until the broken part can be replaced.

"This is aggravating and means a loss of money to the manufacturer.

"The chief reason for my preference for the Hercules machine is its simplicity.

"It never gets out of order and can always be depended upon.

"Pay a good price for a good machine is may advice—you'll save money in the end—and lots of it. In my opinion the Hercules is the model machine of to-day; it combines every feature that goes to make a perfect concrete block machine and is giving satisfaction all over the civilized world."

W. J. Paxton of Detroit, representing the promoters of a new Portland cement company, is negotiating with the city authorities of Alpena, Mich., asking in consideration of locating a plant in that city that the taxes be limited to a nominal sum for eight years by the city authorities. Mr. Paxton's associates in this enterprise are J. B. & E. L. Ford of Toledo, O.; B. F. Barrie, S. T. Crapo, H. Paxton of Detroit, Geo. B. Morley of Saginaw and Geo. R. Ford of Toledo, O.

A petition in involuntary bankruptcy has been filed against the Commercial Concrete & Building Block Co. of Milwaukee which is being contested by the company. U. S. Marshal Thomas B. Reid has been appointed temporary receiver pending the election of trustees by the creditors of the company.

BUILDS EXPERIMENTAL ROAD.

The State Highway Commission is pushing as rapidly as possible the construction of a number of experimental roads in various sections of the state. There has been much delay in getting this work started, owing to the negotiations it was necessary to take up with various railroads for freight rates. This has permitted work to begin at some points and to be delayed at others.

One stretch of road has been completed at Salem, Ill. This road is situated in Salem township, just outside the limits of the city of Salem. The Highway Commissioners of Salem Township applied for broken stone, which was furnished them, and a piece of road built by the local commissioners; owing to the lack of proper methods, the road thus laid was poorly made. The State Highway Commission completed about 2,200 feet of the work with the aid of a steam roller and modern methods of construction, making as smooth, fine appearing piece of road as can be found anywhere.

The width of the macadam is about 14 feet and put on 8 inches deep; part of the work was resurfacing the road laid by local commissioners, at the end of which was about 600 feet of newly constructed road. The exact cost of this work cannot be ascertained, owing to lack of records on the work done prior to that under charge of the State Highway Commission. The estimated cost of this work per mile, including grading and shaping the subgrade, hauling the stone a distance of about a mile and a quarter, spreading and rolling, is about $2,500. The material was furnished free by the state from the state rock crusher at the Southern Illinois Penitentiary at Menard. The freight on the stone over the Illinois Southern Railroad was paid in ballast.

The contrast between the portion of road built with the steam roller and that upon which the roller was not used, furnishes a most striking illustration of the importance of proper equipment and technical experience in highway construction.

The improved piece of road is attracting a great deal of attention locally, and the travel over other routes in the vicinity is almost entirely diverted to the new road, in spite of the fact that the distance is thus increased.

There is another interesting piece of road work in the vicinity of Salem, which has been carried on through the efforts of Mr. John M. Greene, who for the past six years has dragged and kept in excellent condition one mile of road near his farm. During the past winter it is said that the Greene road was the best piece of road in the county. This piece of road has been kept in better condition than the average road in the county for less money than was spent on other roads where a grader and four to six horses were used. It is an interesting fact that Mr. Green has been using off and on for the past fifteen years a road drag very similar to what is known as the "Split Log Drag," and has done much to interest the people generally in this work, and recommends its general adoption for the maintenance of earth roads.

Jackson, Mich., Aug. 23, 1906.

To the Publisher:

In case you have received any of the papers or discussion from the meeting which the Machine Manufacturers held in Detroit Aug. 8th and 9th, we desire to call your attention to the fore part of the meeting where the writer suggested changing the name of the association so as to enable the mixer and brick machine people to become members. The stenographer left out the suggestion and that part of the discussion does not read right on this account, so you will please insert that: S. L. Wiltse suggested changing the name of the association to be the Concrete Machinery Manufacturers' Association instead of Concrete Block Machine Manufacturers' Association of the United States.

For those of you who have not heard anything about the executive session will say that the name was finally changed to the National Concrete Machinery Manufacturers' Association and the officers elected were J. F. Angell, President; O. U. Miracle, Vice-President; Sid L. Wiltse, Secretary, and Mentor Wetstein, Treasurer.

The association also decided to join the National Fire Preventive Association for the purpose of pushing the insurance question. A fire insurance committee was appointed consisting of S. L. Wiltse, J. F. Angell, A. T. Bradley, F. L. Dykema and R. Pulfer, to co-operate with the National Fire Preventive Association and two members of this committee will represent this association in New York at the Fire Preventive Association meeting in May.

The association decided that its members would no longer tolerate the matter of sending their concrete machinery out on trial, as all purchasers of machinery manufactured by members of this association must in each and every instance pay at least some money on the machine when they order.

A committee was appointed consisting of Mr. Dykema and Mr. Miracle to revise the concrete block machine manufacturers' specifications for concrete blocks to include brick and see that said specifications were circularized to all the important cities and towns of the United States for the purpose of getting them to adopt these specifications for the manufacture of brick, blocks and concrete products, as by adopting such specifications a manufacturer of this material could not help but make good concrete blocks and concrete products.

It was the unanimous decision of the members present to put forth every effort to inform every one of their customers the special point of taking particular pains to see that they put some cement in their blocks and brick and make nothing but the best, as the insurance people will not give us a good rate on this product, especially blocks, until this is done. No more mud blocks, or in other words, blocks without cement in them, will go. We must have good blocks from now on or none at all, regardless of their cost to manufacture. If they cannot be made right, it is the sense of this association that they not be made at all.

Yours truly,

Concrete Block Manufacturers'
Association of the United
States.
S. L. Wiltse, Secretary.

The laws of Massachusetts make it a crime to use less cement than is called for in specifications for public work. District Attorney Moran of Boston has been investigating the quality of concrete being used in the new Boston Normal and Latin school for girls with the view of bringing the matter before the grand jury. The contract for the building was let to the Geo. A. Fuller Co. for $663,980, who in turn sub-let the contract for foundations in which it is claimed the specified amount of cement is not being used. A former city inspector and discharged employe of the contractor brought the matter to the notice of the district attorney, hence the investigation. The Boston school commissioners employed a special committee of leading architects of the country to design the buildings with the view of making them the finest group of school buildings in the city, and therefore desire only first-class work as called for under the specifications.

It would be well to have laws similar to those of Massachusetts spread upon the statutes of every state in the Union, in order to insure good sound work. This would place all contractors on an equality. There would be less poor work due to skimping of suitable material and workmanship.

Similar laws exist and are rigidly enforced in Europe. Why not here?

CEMENT FAMINE IN FRISCO.

Great Scarcity of Material May Delay Building Operations.

The eyes of the world are now centered on San Francisco as a cement market. It is computed that when the new buildings that will be constructed of reinforced concrete get under way this city can take all the cement that can be shipped here and cry for more. The railroads report that the shipments are moving in. From the markets in the east, in Colorado and Kansas, and even from the mines within the borders of the state, cars of cement are on the way to this city. In the cities of the old world there is a stir, and barrels of cement are being loaded on vessels in Germany and northern Europe and headed in this direction.

The immediate consumption of cement will not be great, as the buildings that will require most of it are not yet under way, but even now there is a large amount of it used, and the demand is on the increase. The shipments from foreign ports will not reach this city for some time, and until they do the demand will have to be met with shipments from the cities of the east.

One firm in the city has ordered 10,000 barrels, and says that it can use it all in a month. Another firm has offered to take all the cement that can be shipped to the city. It is evident that there will be a great premium on cement, and every effort is being made by the mines in the state to increase their capacity and meet the growing demands for the building material.—San Francisco Chronicle, August 14th.

The Keystone Cement Block Co., of Allentown, Pa., has secured the contract for the new car barns for the Lehigh Valley Transit Co. Cement blocks are given the preference over all other materials for this work after thorough testing on account of durability, economy and appearance.

This company has supplied the block for a large number of buildings within the last year and is destined to become an important industry in this community. Among the buildings erected in which this company's blocks have been used are the People's Light, Heat and Power Company's station, at Mahanoy City; a handsome residence for ex-Congressman Ryan, at Mahanoy City; a handsome residence for P. F. Monoghan, at Shenandoah; a summer residence for Jas. W. Knoll, at Cresco, Pa.; the Howertown church, at Howertown, Pa.; the church of the Keneseth Israel Congregation, at Thirteenth and Maple streets, Allentown; the residence of H. H. Eastman, at Seventeenth and Linden streets, Allentown; the foundry building of Charles Spangler, at Third and Walnut streets, Allentown; a three-story business house at Norristown for B. E. Bloch, and a number of other buildings. This company has also supplied the block for a number of ornamental stone fences, among them R. B. Delp's at Eighth and Linden streets, Allentown; Benjamin Fenstermacher's, at Neffsville, and Fred Stump's at Rittersville.

Concrete Reduces the Price of Brick.—The New York Commercial says that some six hundred houses are to be constructed by contractors in the city of Brooklyn, and in Queens and certain suburbs in New Jersey. It would seem that concrete in one part of the country at least has much to be responsible for in a curtailed demand for brick. This falling off in demand has reduced the price of brick about 50 per cent in three months, and this is enough to produce serious modifications in the brick business with ulterior, and very possibly serious, effects in the real estate business. In the latter there is a lively movement in the purchase and sale of apartment houses, and where prices are largely determined by prospective rentals and the cost of materials used in construction, anything like a permanent drop in market prices for brick at a time when the city has been overbuilt in the matter of the cheaper grade of tenements and when rentals are being cut, is pretty sure to affect the market for such real estate very seriously.

From all parts of the country, and especially from the West, continue to come reports of the popularity of concrete as a building material; and there is no doubt that whatever eventuates there will be a very general trial of this material in the construction of the next few years. There is therefore no good reason to anticipate any great appreciation in the price of brick, which was abnormally high when the decline set in, according to the builders.

BOOK NOTICE.

The Alsen American Portland Cement Co. has published for free distribution a small 20 page pamphlet, that contains much useful information on the subject of Portland Cement, which will be appreciated by cement workers and consumers, which will enable them to distinguish between sound and unsound cement. It is simply a plain talk on the characteristic of good, sound cement. Address Alsen's American Portland Cement Works, 45 Broadway, N. Y.

The steamer Saennec, 136 days out from Antwerp, Belgium, arrived at Astoria, Oregon, with 15,227 barrels of Belgian cement.

HELDERBERG CEMENT COMPANY.

The stockholders of the Helderberg Cement Company held their annual meeting and elected the following directors:

T. Henry Dumary, John W. McNamara, William McEwen, Anthony N. Brady, Robert C. Pruyn, Frederick W. Kelley, James C. Farrell, Thomas E. Murray, Edward L. Pruyn, Chas. H. Ramsey, James B. McEwan and Howard Von Rensselaer.

These inspectors were elected: Edward J. Hussey, Samuel J. Haight and Walter W. Batchelder.

The Iowa Portland Cement Co. has been incorporated to erect a plant at Mason City, Iowa. Capital $2,900,000, of which $1,200,000 is 7 cent preferred and $700,000 common. The plant is to have a capacity of 2,500 barrels per day, and a working capital of $100,000. The officers of the company are as follows:

Geo. E. Nichelson, president; A. B. Cockerill, vice-president; L. L. Northrup, treasurer; J. C. Burch, Chicago, Ill., secretary. The Hunt Engineering Company will build the plant.

The American Tobacco Co. has adopted reinforced concrete construction for its factory buildings in the United States and Canada. Five large buildings in reinforced concrete are now under construction in Chicago to cost not less than $1,000,000. Three of these buildings will be used by the Spaulding & Merrick Tobacco Co. and August Beck & Co. The remaining two buildings will be occupied by the American Snuff Co., all subordinate to the American Tobacco Co.

A large reinforced concrete tobacco warehouse and factory is likewise under construction at Montreal for the same company. Other factory buildings will be erected in other parts of the country and in Cuba in the near future.

The Weber Concrete Chimney Co. of Chicago will erect a reinforced concrete chimney for the Eldora, Iowa City, pumping plant, 75 feet high for $1,125, to be completed October 1st of the present year.

These gentlemen propose to erect a 3,000-barrel mill at Alpena and to use lime stone instead of quartz in the manufacture of cement.

I. M. Yost of Hays City, Kans., is promoting a cement plant six miles west of Hays City, where chalk deposits are located. A town is to be built at the plant site, to be known as Yocemento. After promotion of the enterprise 440 acres of land conveying raw material have been purchased. Hays City capital will back the enterprise.

MIRACLE PRESSED STONE CO.

The Miracle Pressed Stone Co., one of the leading manufacturers of concrete machinery, concrete block forms, sewer pipe moulds, concrete mixers, sidewalk tile machines, drain tile moulds, cement sidewalk tools, cement brick machines, all of which are now in extensive use throughout the United States and Canada.

This machinery is sold on honor—that is, it is placed on sale upon its merits. This is particularly true of the Miracle Staggered Air Spaced Cement Building Block, which interposes a double air space between the inner and outer faces of the wall of building to exclude and prevent the penetration of either frost or moisture from the outside to the inside of concrete walls. The Miracle Pressed Stone Company has just published a large and handsome book of instructions on concrete building block manufacture and other concrete products, combined with a full description of their own concrete machinery and specialties, covering almost every line of reliable cement products now on the market and in practical use by first-class cement workers. The concrete building block industry has experienced a wonderful development during the past few years. Large and small factories are springing up throughout the country. All as a rule are making money and will continue to make money as long as they produce good, sound work and from good, sound materials. The Miracle people place their machinery in groups or special outfits, each complete in themselves, ranging in price from $50 up to several thousand dollars per outfit. Full particulars may be obtained by addressing The Miracle Pressed Stone Co., Minneapolis, Minn.

J. M. Cameron of Harrisburg, Pa., will erect one of the finest dwellings in the state at South Mountain, Nev., Moore's Station.

The building will be concrete construction. A porch 140 feet long and a large roof garden will form leading features. Twenty-five hundred barrels of cement will be used. Sipscomb & Co. of Washington, D. C., will do the concrete work.

Seven ship loads of European cement are expected to arrive at San Francisco before September 1st. The people of California are on the lookout for this cement, as much construction work is being delayed for the want of cement.

Ashtabula county is advertising for bids for the construction of a reinforced concrete bridge over Mills creek, Jefferson township. Address County Auditor, Ashtabula, Ohio.

NEWS NOTES.

Mt. Clemens, Mich., is asking for bids for a large lot of curb and gutter work. Bids close Sept. 4. Address Wm. F. Krocht, City Clerk.

The Atlas Portland Cement Co. is shipping 200 tons of cement by steamer to Colon, for the Panama canal. Heretofore cement has gone by sailing vessels.

The U. S. Steel Corporation is considering the erection of a Portland cement plant at Youngstown, Ohio, to cost $1,000,000, in connection with its large iron furnaces at this point.

A company known as the Portland Cement Co., Ltd., has been organized to erect a plant at Gonor, fourteen miles northeast of Winnipeg, Man., on the line of the Canadian Pacific Ry.

A concrete coffin factory is to be erected at New Orleans, La., by H. W. & S. H. Richardson of Louisville, Ky. One hundred and fifty coffins per day will be the capacity of the proposed plant.

The Portland Cement Co., Ltd., of Manitoba, is the name of a new company which proposes to build a Portland cement plant at Gonor, Man., on the line of the Canadian Pacific Ry., northeast of Winnipeg.

There is still a shortage of cement in various parts of the country. Contractors have been compelled to suspend work on street foundations on account of being unable to receive quick delivery of cement.

Cement Products Co., Rochester, N. Y.; manufacture and deal in cement products, etc.; capital, $10,000. Incorporators: Peter J. Harkins, Robert N. Curtis, George A. Cooley, Alfred W. Curtis, Rochester, N. Y.

The Michigan Alkali Co. has purchased 50 acres of land at Wyandotte just south of Detroit, on the Detroit River, upon which a 1,500-barrel cement plant is to be erected. Mud and clay will be brought from Ohio and limestone from Alpena. Coke ovens and blast furnaces will be erected later on part of the land. It is reported that the Michigan Alkali Co. will spend $1,000,000 in developing the property.

The Alpena Portland Cement Co.'s day crew broke the record on Aug. 9th by making 1,040 barrels of cement in 12 hours. The night gang following the large run turned out 630 barrels, making 1,670 barrels in 24 hours.

A concrete canal lock on the Miami & Erie canal will be built near Lockland, O., by Frank Davis of Hamilton, O., on the identical spot where Governor DeWitt Clinton of New York in 1832 turned the first shovel full of earth in the digging of the canal.

The Riverside Improvement Committee of the City of Detroit Board of Commerce is urging river front property owners to build Reinforced Concrete docks instead of the present wooden ones, as the maintenance of the concrete docks would be practically nothing.

Heath & Milligan Manufacturing Co. of Chicago will erect a large paint factory of reinforced concrete. The building will cover the entire frontage of the block on Lumber street, from Canal to Seward streets. It will be one of the largest and up-to-date paint factories in the country.

The Methodist church of Ann Arbor, Mich., will replace the wooden church steeple with a reinforced concrete steeple on account of economy in painting and repairs. It costs $500 every time the wooden steeple is painted, while a concrete steeple will require neither paint or repairs.

Cement is scarce in California. City Surveyor Boid of Sacramento has requested the city to defer the letting of the concrete bridge over Buffalo Creek for 30 days on account of the scarcity of cement that several cargoes of European cement are due to arrive within two weeks from Europe, as more favorable bids can be had

ARCHITECTS' AND ENGINEERS' HANDBOOK OF
Re-Inforced Concrete Constructions
172 pages. Illustration and Diagrams 217 Pages.
By L. J. MENSCH, C. E.
Cloth, $2.50, Paper, $2.00, Sent Postpaid.
Cement and Engineering News,
226 La Salle Street, CHICAGO, ILL.

from contractors when the cement famine is broken by the arrival of this European cement.

The four Portland cement plants in Indiana produced 1,864,199 barrels of Portland cement in 1905, two other plants started up in March of the present year having a combined capacity of 3,600 barrels per day; making six mills in operation in 1906 with the seventh plant under construction.

Henry E. Cordell, architect of the city of Chicago building department, has been making tests to demonstrate that reinforced concrete is not fireproof by roasting a steel column covered with concrete and expanded metal in a furnace for seven days. The column crumbled after being removed. This is not a fair test. A solid granite column subjected to the same test would have fallen into fragment after 7 days' roasting.

The asphalt pavement on Woodruff Place, Indianapolis, was raised up in several places and on digging down through the asphalt and cement foundation, mushrooms were found growing under the elevation. The question has been raised and discussed by City Hall officials as to whether mushrooms could lift up the pavement. State Geologist Blatchley holds that mushrooms could not force up a well constructed pavement. Yet the fact exists that directly under the points where the pavement heaved, mushrooms were found.

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Manufacturers of
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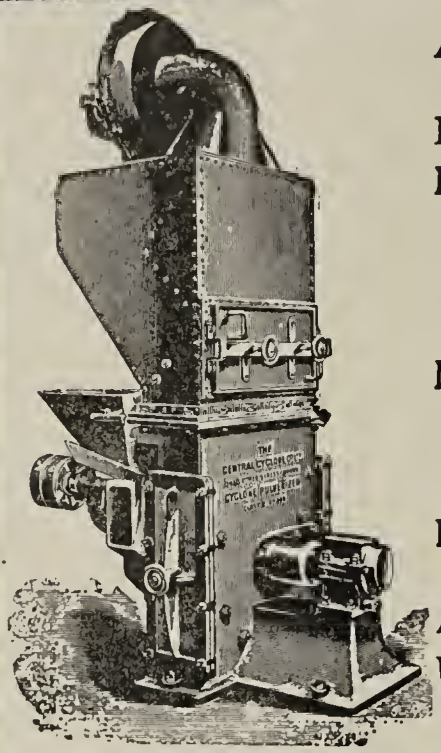

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General Industrial Agent, Seaboard Air Line Railway, PORTSMOUTH, VA.

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about 700 acres of Marl. Pronounced by College Chemist to be good for Cement. Near two railway lines and clay. Address, S. W. BARKER, Grand Rapids, Mich.

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Two Large Second-Hand Continuous Drake Concrete Mixers in good order. Address A. O. WALWORTH, 15 South Canal Street, Chicago.

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Position as Construction Foreman or Superintendent for out of town work, also acquainted with laying of cement blocks. Eight years experience. First-class references. Competent to lay out work. Address, C. B., care CEMENT AND ENGINEERING NEWS.

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For cement plant, who is willing to shift for night and day work. Address with references, "General Foreman," care CEMENT AND ENGINEERING NEWS.

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Chemist, college graduate with 7 years practical experience as chemist and superintendent of Portland Cement plants, desires to make a change. A 1 references. Address "B. C.", care Cement and Engineering News.

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A Chemist for portland cement plant in Spanish America. Mail full statement of particulars of past experience and references to

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A second-hand Ball Mill for grinding Portland Cement clinker. Must be in first-class repair. Address "Ball Mill," care of CEMENT & ENGINEERING NEWS.

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Superintendent for large Portland Cement plant in the Middlewest; must be good engineer. Should understand both wet and dry process. Give reference and salary expected. Address P. O. Box 84, Detroit.

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Young man who understands the cement building block business and who is qualified to sell machines for making the blocks through correspondence. An excellent opportunity for the right man. State age, experience and salary expected. Address F. H. KEENE, Sears, Roebuck & Co., Homan Ave. & Harvard St., Chicago, Ill.

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These coolers have never been used, and are in A-1 condition.

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WANTED

An experienced master mechanic and mill wright in cement plant with capacity of 900 barrels per day, dry process. Position will pay a good salary and be permanent for responsible man. Give description of past engagements and furnish references. Address

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An old Rotary Dryer. State dimentions, general condition and lowest price. Address "Rotary Dryer," care Cement and Engineering News, Chicago, Ill.

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By a Cement Company in the South a thoroughly reliable, experienced chemist. Apply, stating age, salary required, and give references, to E. C., care of CEMENT AND ENGINEERING NEWS.

Superintendent for Portland cement mill wants change, 30 years, good record, good engineer. Address, "Portland," care of Cement and Engineering News.

WANTED

CEMENT BURNER, experienced in wet process. Apply immediately, giving references, stating age, experience, salary wanted, whether married or single, and how soon could come. Address "Cement." care of CEMENT & ENGINEERING NEWS.

WANTED

An experienced chief mechanic and millwright in cement plant having eight kilns. Will pay good salary to responsible man, and one who can take charge of repairs to machinery. Give full description of past engagements, and submit references. Address "Box E," care of CEMENT AND ENGINEERING NEWS, 22 Fifth Ave., Chicago, Ill.

Superintendent wanted for cement mill using dry process. Answer stating previous experience and salary desired. Give references, and state when at liberty. Communications confidential. Alabama Portland Cement Co., Demopolis, Ala.

POSITION WANTED—By a chemist with a good technical education and three years' experience in the manufacture of Portland cement. Can furnish good reference. Address "Chemist," care of CEMENT & ENGINEERING NEWS.

A CONCRETE expert, with six years' experience in general concrete construction and several years' successful experience in designing block and other concrete machinery and block construction, is open for an engagement with first-class parties. Good references. Address "O. K.," care of CEMENT & ENGINEERING NEWS.

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WANTED

Position by Cement Burner, young man, unmarried, experienced and capable of getting large output from kiln, wet process preferred. Address, J. R., care of CEMENT AND ENGINEERING NEWS.

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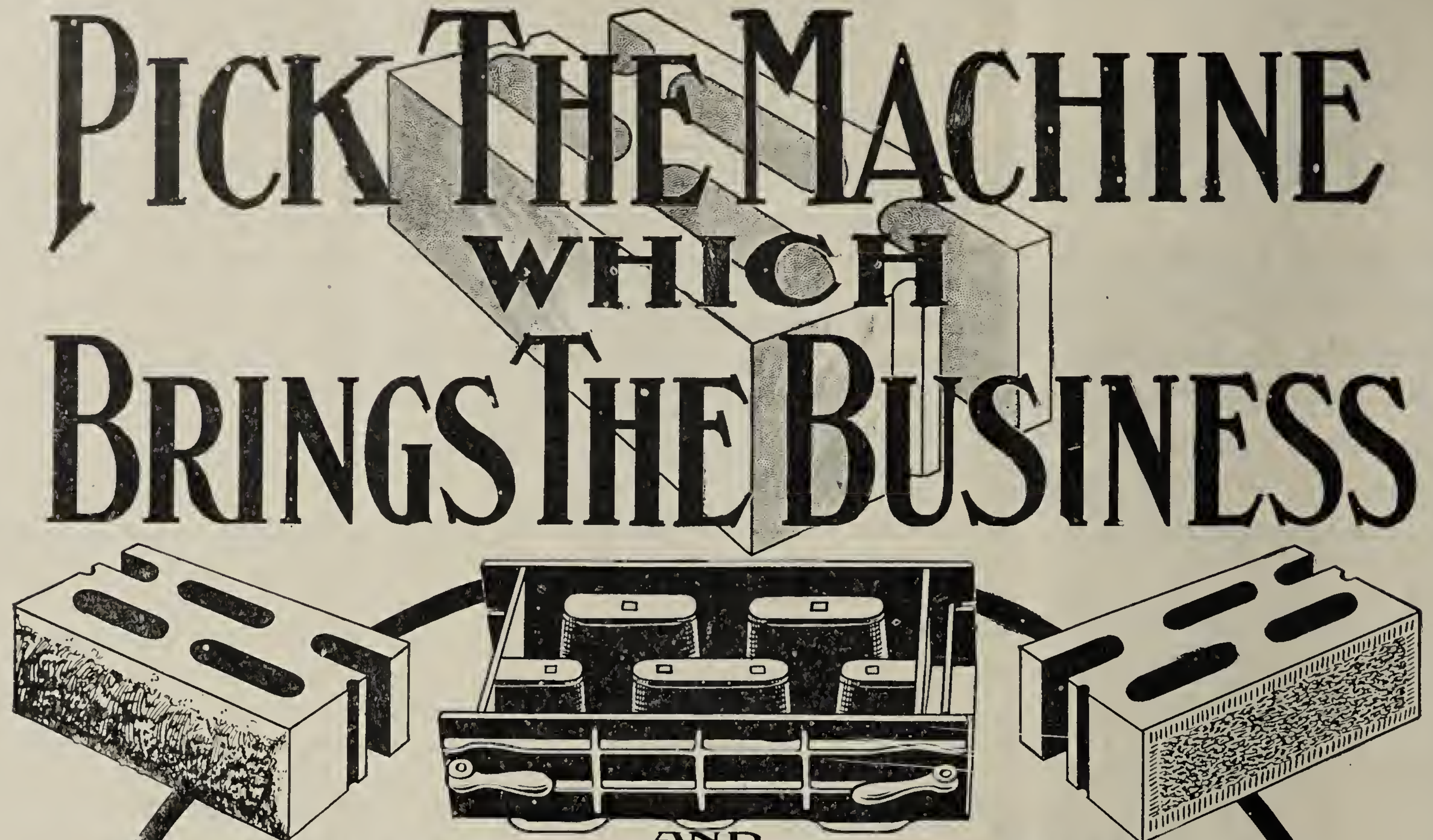

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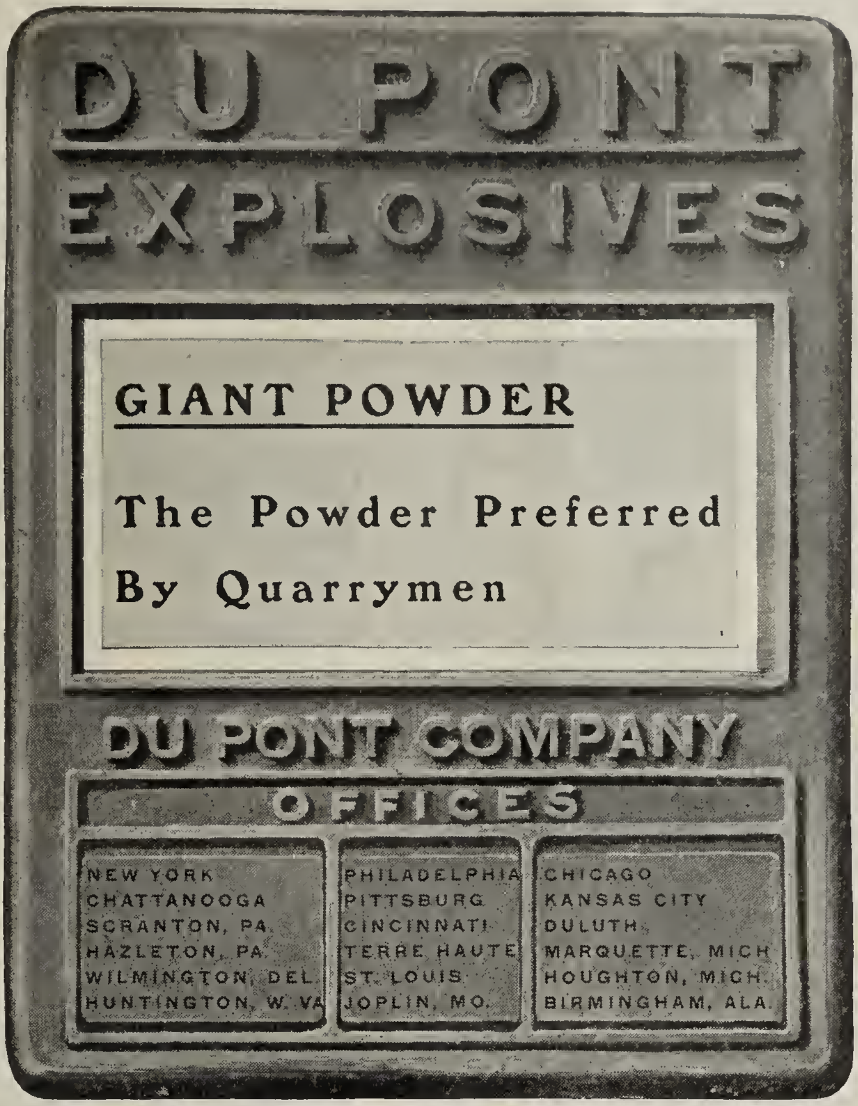

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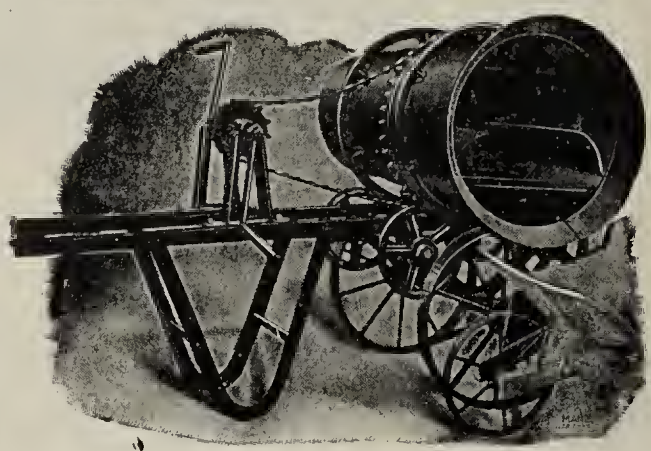

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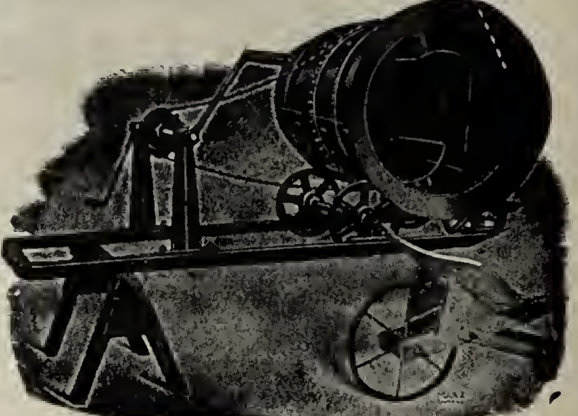

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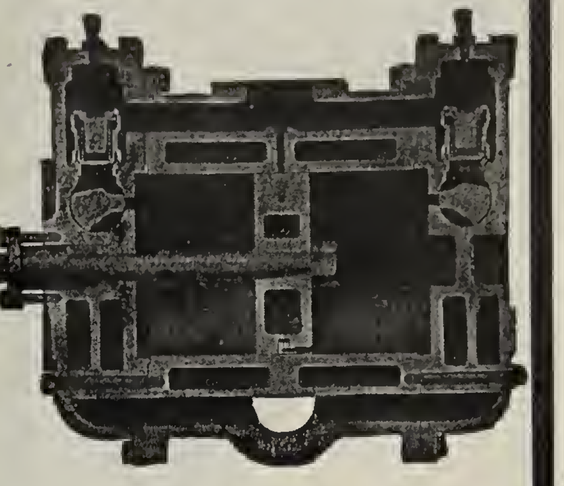

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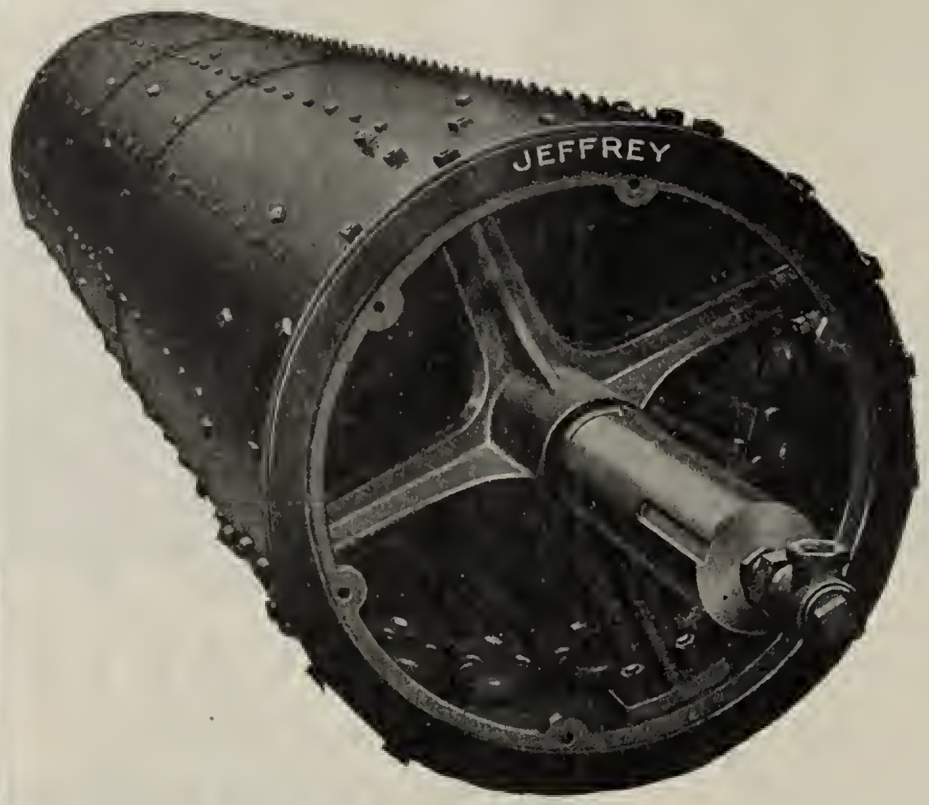

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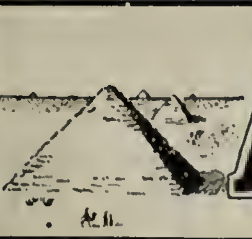

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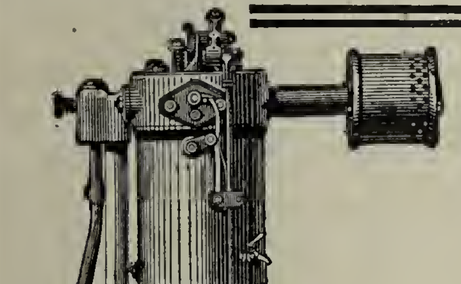

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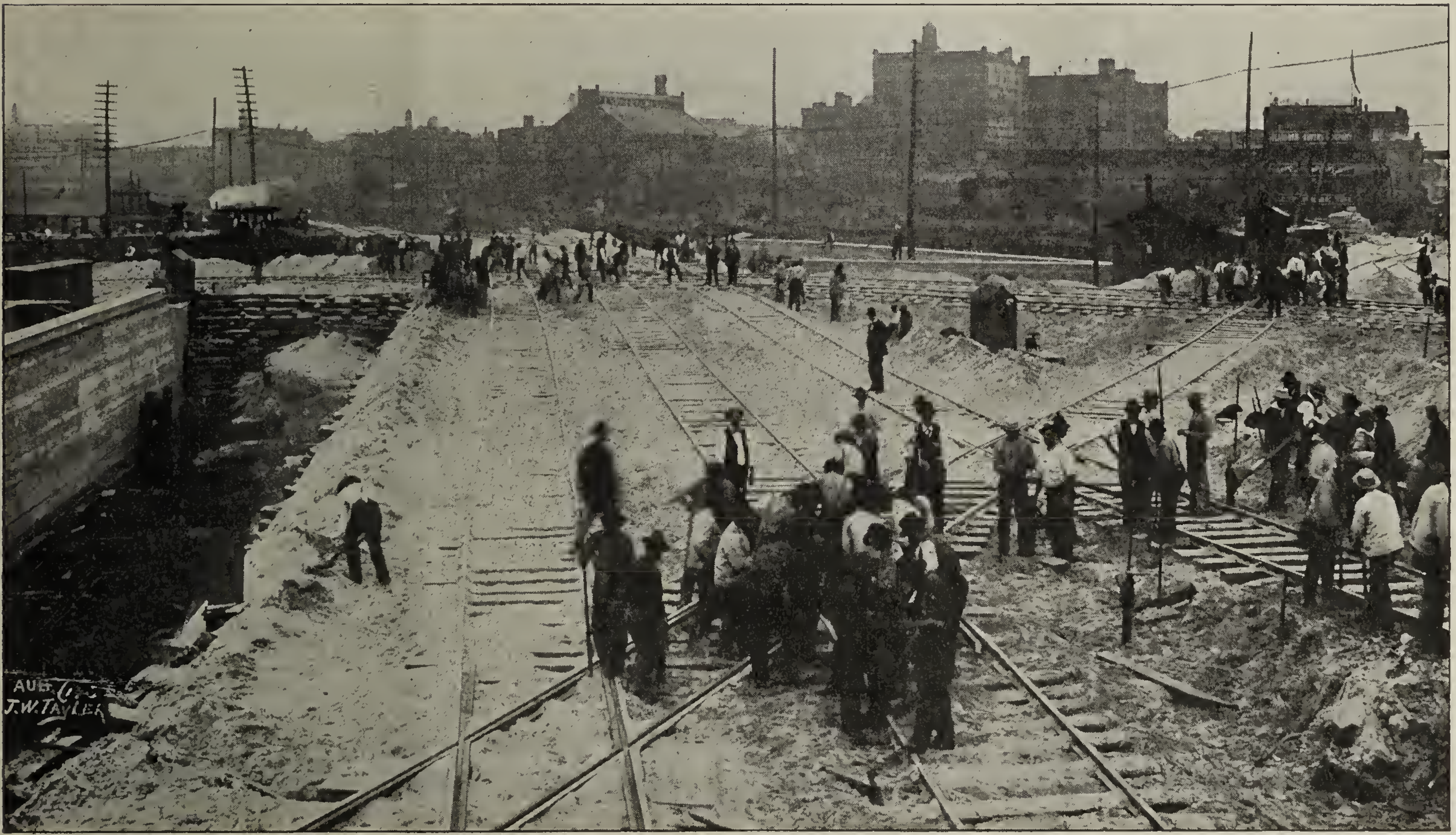

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CEMENT AND ENGINEERING NEWS
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This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, SEPTEMBER, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

ROCK-FACED CONCRETE BUILDING BLOCKS.

We hear now an then much adverse criticism leveled at the rock-faced concrete building block which is now extensively used in this country. The same arguments were advanced against rock-faced stone before the concrete building block was known. Architects for many generations have been taught to worship only the classical lines found in the perfect models of the ancient Greek and Roman structures in which rock-faced stone was never used. Therefore the rock-faced stone is condemned. The architectural schools of Europe teach and impress upon the minds of their students that the classical structures of Rome and Greece, are alone worthy of study. Every other style of architecture is to be carefuly avoided; so said an eminent professor of architecture in a leading school of architecture in Vienna, less than five years ago. Poetry, sculpture, art and architecture attained their greatest perfection in Greece and Rome some 2,000 years ago. Temples were erected in honor of the Grecian deities, while the Romans imitated the Greeks and erected temples to their own Gods, such as Apollo, Mars, Venus and Diana. These buildings were usually of marble or granite adorned with sculpture, always of rubbed stone beautifully carved. Now and then villas were erected in the same classical style, while the common people lived in shacks. We are not building of marble or granite. As a rule marble will not weather well in this climate and granite is too costly, yet these ancient models are held up to us to follow, and we are therefore asked to discard the humble rock-faced concrete building block. The same argument could with equal force be directed against common brick, of which the United States produced in 1904 eight billion six hundred and sixty-five million five hundred and seventy-one thousand, valued at $51,768,558; while we only produced four hundred and thirty-four million, three hundred and fifty-one thousand front brick, valued at $5,560,131. The value of the increased output of common brick in 1904 over that of 1894 was $16,706,020, while the increased value of the production of face brick for the same year was only $1,160,764. These facts show that the demand for style, which the pressed brick represents, is not as great as the demand for utility and low cost as represented by the demand for common brick. Concrete building block is displacing common brick more often than pressed brick; and will continue to do so, and as a rule the rock-faced concrete block is in the greatest demand. What the people want is something durable and reasonable in price; this the concrete block fulfills and especially the rock-faced block. It meets the requirements of the man off affairs who does not concern himself with the classical lines of ancient architecture. If the concrete building block industry had to exist on the custom men who are educated up in the classical architecture, it would not be where it is today, invading every hamlet in the land with its push, enterprise and practical results.

The only objection to the rock-faced stone is the monotony produced by a single mould or die pattern; while each pattern will produce two distinct forms by simply turning the block bottomside up. Thus ten rock-face patterns will give twenty different designs laid up in the wall. The rock-faced pattern aids in making the wall appear more massive and solid, which is a desirable feature.

HAS EXHIBITION IN BALTIMORE.

The Ideal Concrete Machinery Co., the well-known builder of hollow concrete building block machines, with factory at South Bend, Ind., has installed an exhibit in the permanent exposition department of the Builders' Exchange, Baltimore, Md.

The city of Dayton, Ohio, has approved of plans and specifications for cement sidewalks and curbs and gutters for a number of streets. The work has not yet been advertised.

The Atlas Portland Cement Co. will increase the wages of its employes at Hannibal Works from and after the first of October.

CORROSION OF STEEL.

The rapid corrosion of steel, especially fence wire, has induced the United States Department of Agriculture to make a thorough investigation of the subject. The old style iron fence wire made from 20 to 30 years ago has withstood corrosion much better than the modern steel wire which has now entirely displaced the iron wire. Iron wire fences erected over thirty years ago are still in a fair state of preservation, while the life of modern steel wire is only from two to five years. Even where the wire is galvanized it does not possess the weathering properties of the old-fashioned iron wire. In fact the galvanized wire corrodes much faster than the plain steel wire at points where the galvanizing coat is defective, due to chemical re-action between the two metals, producing local electrical currents at the exposed points. The rapid corrosion of steel is due to the impurities it contains, and principally to manganese, which is found in small particles distributed through the mass, which like the exposed iron through the galvanizing coal sets up chemical reaction between the two metals, resulting in the production of local electrical currents. The work done by these currents is corrosion. What is true of steel fence wire is equally true of steel pipe, roofing plates, I beams and steel rails. In order to give longer life to steel exposed to the elements the steel mills are specifying ore containing less manganese and other impurities. The writer has seen steel I beams supporting vault covers in damp situations so much corroded after ten years of service that the web of the beam could be broken through with the thrust of a cane or walking stick. The question of the stability of our modern steel frame building being undermined by corrosion has frequently been discussed in a general way without throwing much light on the subject. In a number of instances structural steel frames have been examined and found practically free from corrosion after fifteen years of service. Yet the fact remains, that steel conveying impurities, especially manganese, is not a long lived material, unless thoroughly protected by paint, or better still, an envelope of concrete.

Morocco imports about 55,000 barrels of Portland cement per annum, the selling prices ranging from $2.60 to $3.00 per barrel of 400 pounds.

The American Brotherhood of Cement Workers have a membership of 15,000.

WOODEN WALKS OUT OF DATE.

Municipal corporations, large and small, are beginning to recognize the fact that wooden sidewalks are out of date, as they are short lived, and constantly out of repair, and a fruitful source of litigation. Accidents resulting to pedestrians passing over defective wooden walks involve such corporations in damage suits brought by the injured persons. Claims for damages in such suits against the city of Chicago alone are now pending to recover $20,000,000, while judgment for more than one million dollars has been rendered against the city, upon which interest is being paid, because the city has no funds available to satisfy these judgments. The city of Montreal has had its trouble with wooden walks. Heretofore it has paid for all of this class of walks laid within its corporate limits and has attempted to keep them in repair. The strict accountability to which cities are held under the law to provide and maintain safe walks has brought a flood of damage suits against the city arising from injuries received on defective wooden walks, and has caused the city to prohibit the laying of wooden walks in future, and providing that only cement walks shall be laid. For these cement walks the city furnishes the money and charges back one-half of the cost to the lot owner in each individual case. This gives the city permanent walks and does away with the numerous damage suits. Many smaller cities now prohibit the use of wooden walks, substituting cement walks, on the ground that a cement walk will be cheaper in the end, as it calls for little or no repair. Thus wooden walks are being gradually banished from our streets.

The Standard Portland Cement Co. of Napa Junction, Cal., has employed Farley, the strike breaker, and 200 men to take the place of the company's employes who are out on a strike. The new men are quartered on the company's ground in new bunk houses, especially erected for the purpose since the strike, which commenced August 23d. On September 12th, the company filed a bill for an injunction against the officers and members of the Federal Labor Union, No. 1,345. of Vallejo, of which its former employes are members, to prevent such employes from interfering with its business.

Mr. J. N. Kennedy, superintendent of the Alma Cement Co., Wellston, Ohio, since its erection, has resigned and is now associated with Mr. B. B. Lathbury, consulting engineer, Philadelphia, Pa.

THE UNIVERSAL PORTLAND CEMENT CO.

On October 1, 1906, the Universal Portland Cement Co., a new subsidiary company of the United States Steel Corporation, will take over the plants and business of the cement department of the Illinois Steel Co., and will continue the manufacture of Universal Portland cement of the same high quality as heretofore. Edward M. Hagar, who has for six years been manager of the cement department of the Illinois Steel Co., is president of the Universal Portland Cement Co., with headquarters in The Rookery, Chicago. The board of directors consists of the following:

Judge E. H. Gary, chairman of board of directors United States Steel Corporation.

Mr. E. J. Buffington, president Illinois Steel Co.

Mr. A. C. Dinkey, president Carnegie Steel Co.

Mr. T. J. Hyman, secretary and treasurer Illinois Steel Co.

Mr. Edward M. Hagar, president Universal Portland Cement Co.

The present output of 6,500 barrels a day of Universal Portland cement at South Chicago, Ill., and Buffington, Ind., is being increased by a new plant at Buffington with a capacity of 6,000 barrels a day, and a plant at Universal, Pa., near Pittsburg, to have a capacity of 4,500 barrels a day of Universal Portland cement. When the new plants are in operation in the summer of 1907, the total output of the Universal Portland Cement Co. will be over 17,000 barrels a day of Universal Portland cement.

The cement manufactured in the new mills, as well as the old, will be made from slag and limestone by the same special process and under the same supervision which has been so succesfully employed by the Illinois Steel Co. since May, 1900. In the manufacture of Universal Portland cement the two raw materials, crushed limestone and chilled blast furnace slag, are first dried, then thoroughly ground together in proper proportions, and burned to a clinker in rotary kilns. This clinker is afterwards finely ground, and the resulting product is a true Portland cement, its method of manufacture and chemical composition being strictly in accordance with the definitions of the most prominent cement authorities in the United States and Europe.

True Portland cement made from slag should not be confused with Puzzolan or so-called "slag cements," which are simply mechanical mixtures of slag and slaked lime ground together without burning, the latter being suitable only for use under ground and in moist locations.

The remarkable increase in demand for Universal Portland cement, an evidence of its high quality, is shown by the following figures of production by years since first placed on the market:

	Barrels.
1900	32,443
1901	164,316
1902	318,710
1903	462.930
1904	473,294
1905	1,735,343
1906 (estimated)	2,200,000

The production of Universal Portland cement has shown a steadily increasing percentage of the production of the entire country, and in 1905 exceeded the production of the United States in 1896. When the new mills are in operation the output of the Universal Portland Cement Co. will exceed ten per cent of that of the entire country.

Both the new plants will be driven entirely by electric power from generators connected to gas engines using blast furnace gases. The power will be transmitted ten miles to Buffington from South Chicago at 22,000 volts from two 2,000 K. W. generators located at the South Works of the Illinois Steel Co., from which point the supply of slag will be obtained. For

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	JULY				SEVEN MONTHS ENDING JULY			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	67,200	$ 215	11,569,600	$32,873	6,894.800	$ 21.760	31,697,600	$ 91,686
Belgium...........	2,311,400	6,835	10,857,349	31,339	66,691,515	209,569	64,021,062	197,800
France............	....	......	1,488,000	5,095	4,026,300	14,302	10,093,006	33,430
Germany..........	13,280,767	41,562	15,461,293	54,581	82,979,373	271,845	113,290,585	382,578
All Other Europe.	....	......	....	....	240,659	609	8,332	22
British North Am.	700	6	890,370	6,432	127.660	1,368	2,229,920	15,294
Other Countries..	....	......	22,381,119	102,453	447,060	1,613	41,387,614	184,609
TOTAL...........	15,660,067	$48,618	62,647,731	232,773	161,407,367	$521,066	262,728,119	$905,419
Domestic Exports of Cement, bbls.	111,618	$145,808	57,292	$82,193	589,469	$792,755	328,485	$506,595

There were 7,771,343 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in July 1905, valued at $26,048, against 6,157,828 lbs. in July 1906, valued at $18,021.

For 7 months ending in July 1905, there were 64,552 tons of asphalten imported in the United States, valued at $277,229 against 52,629, tons imported in 7 months ending July 1906, valued at $216,554.

the plant at Universal, Pa., near North Bessemer, the power will be transmitted seven miles from two 2,000 K. W. gas-engine-generator units at the Carrie Furnaces, Homestead Works, of the Carnegie Steel Co., which furnaces will also supply the slag.

The cost of the two new plants will be $3,000.000 and the equipment will be such as to make them modern and efficient in every way.

Contracts have been placed for 21 rotary kilns, 7 feet 6 inches in diameter and 120 feet long, 47 tube mills, and for dryers, preliminary grinders, etc., these orders being the largest ever placed at any one time for cement making machinery.

The buildings at each of these cement plants consisting of raw material bins, dryer building, raw material mill, burner building, finishing mill, stock houses and miscellaneous buildings, such as machine shop, transformer station, office and laboratory, are being built entirely of steel and concrete, the largest buildings being the stock houses, 600 feet long and 100 feet wide, giving a storage capacity at each plant of over 400,000 barrels of finished cement.

The constant use of Universal Portland cement for the last five years in all classes of cement work, such as sidewalks, floors, artificial stone, reinforced concrete, general engineering work, foundations, piers, dams, fireproofing and general building construction, has given it a splendid reputation as a standard Portland cement of the highest quality.

Universal Portland cement is a true Portland of the highest grade, suitable for all purposes for which Portland cement is used; in other words, "A Standard Portland for Universal Use." It is guaranteed to be fully equal for all classes of work to any other Portland cement manufactured in this country or abroad.

John P. Cunningham has filed a petition for injunction against the Armored Concrete Construction Co. in the Circuit Court No. 2 of Baltimore to restrain the defendants from removing forms from the concrete beams on the first floor of the building, 123 South Charles street, now under construction, on the ground that the removal of the forms would injure the building.

Three hundred men are now engaged in erecting 30 concrete houses at Watervliet, N. Y. (postoffice address, West Troy, N. Y.), to house the employes of the spring factory which located at Watervliet. Wm. Preston is the contractor for the work.

USE OF CEMENT IN WASHINGTON, D. C.

A short time ago the contractors building the new terminal station shipped back to one of the companies furnishing Portland cement for that structure a carload of the sacks in which it was shipped and received a rebate of $1,500, at 10 cents a sack. This is perhaps one of the most striking illustrations to be found of the increasing use of concrete in structural work. On the union terminal, including its approaches from the north and the tunnels from the south, more than 750,000 barrels of this cement will be used. In 1905 this cement cost on the average $1.44 a barrel, and this year it has brought $1.59 a barrel in large lots. The average price paid by the contractors has been about $1.50 a barrel, so that about $1,125,000 has been paid for this single form of structural material.

But the cement used at the station is not all that has been brought to Washington for structural purposes. The District property clerk purchased 62,527 barrels of Portland cement in 1904, costing $118,342. In 1905 he purchased 58,082 barrels for $83,908, and in the fiscal year ended last June the outlay was $120,933.90 for 75,994 barrels. The District government uses this cement in large quantities for the construction of sewers, bridges and concrete sidewalks. The amounts mentioned, however, do not include that used by contractors on the new municipal building, the Connecticut avenue bridge and that at Piney branch. After talking with several of these contractors an approximate estimate of the amount of Portland cement used in the District in the twelve months ended last June was 300,000 barrels.

At 20 barrels to the team load would require 15,000 wagons to transport the cement from the cars to the place of consumption. The cement piled in one heap would fill the Capitol plaza and lay a cement sidewalk of the usual thickness and width halfway around the borders of the District.

With the replacing of brick sidewalks by concrete and the completion of the sewer system, with the necessary building operations, it will be many years before the District of Columbia requires a less amount of this material than now. In the building of foundations and thick walls concrete is coming more and more into use. It takes the place of the more costly brick and stone. Moreover, when the cement is mixed with broken stone in the right proportions the resulting structure is better than one of stone or brick, because of its solidity, lack of joints and homogeneity. In fact, these results have made the use of cement by engineers and contractors common rather than its greater economy.

The draft upon the steel industry, upon the forests and the stone quarries has been lessened by the use of concrete, and such enormous undertakings as the irrigation projects of the West, the Panama canal and the largest railroad bridges and viaducts could not go on for lack of material. It is likely that the production of cement is yet only in its infancy, great as it is and startling as the figures look. Perhaps the world will not soon call for larger constructions than the dams, viaducts, retaining walls and locks of the Panama canal, but the irrigation projects of the West will go on, smaller canals may be built and the development of waterways and the probable construction of entire buildings from concrete in the near future will naturally give to the industry unusual momentum in the coming quarter of a century. It is impossible almost to imagine, without some such illustration as the building over of the burned district in Baltmore or the rejuvenation of San Francisco and Valparaiso, what will be the consumption of Portland cement in the future.

Electricity expanded the world work in every direction. Transportation was multiplied a hundred fold for freight and passengers, while the telegraph, cable and telephone have given every man the ear of the world.

So now at a time when the forests are failing, when stone and brick and steel, as structural material, are hardly sufficient to meet the requirements, cement fills the breach and has made possible the most extensive era in building the world has ever seen. More than that the source of cement is apparently inexhaustible.

At the present time cement is the prop and stay of building operations. It goes into the foundations of our street pavements, forms our sidewalks. The foundations of our large structural steel buildings are only made possible by the use of cement. We build cement houses, barns, factories, chimneys, bridges, and viaducts. Our large sea-going steel vessels are lined with it. As a prominent government engineer once said of cement: "We walk on cement sidewalks, we ride on cement streets, we live in cement houses, worship in cement churches, and finally are buried in cement coffins."

From January, 1895, to May, 1906, the United States exported to Germany gold coin and bars valued at $97,853.357, while we imported only $15,600,114 of this metal from Germany during the same period.

REINFORCED CONCRETE STREET RAILWAY STRUCTURES IN EUROPE.

The rapid development of street railways in the larger cities of Europe has called for increased facilities for housing rolling stock, and accommodation for the management; all of which was carefully considered before any decisive step is taken in actual construction. The custom heretofore has been to erect buildings for this purpose of high class stone masonry, as will be found in the cities of Paris, Berlin and Vienna. The city government of Nuernberg having decided to enlarge its street railway buildings, accordingly asked and received plans and specifications for a modern, well-lighted street car depot, car house and power plant in steel, masonry and reinforced concrete. The plans and specifications prepared by the firm of Dyckerhoff and Weiderman in reinforced concrete were found to be the most suitable, and were therefore adopted and the buildings erected.

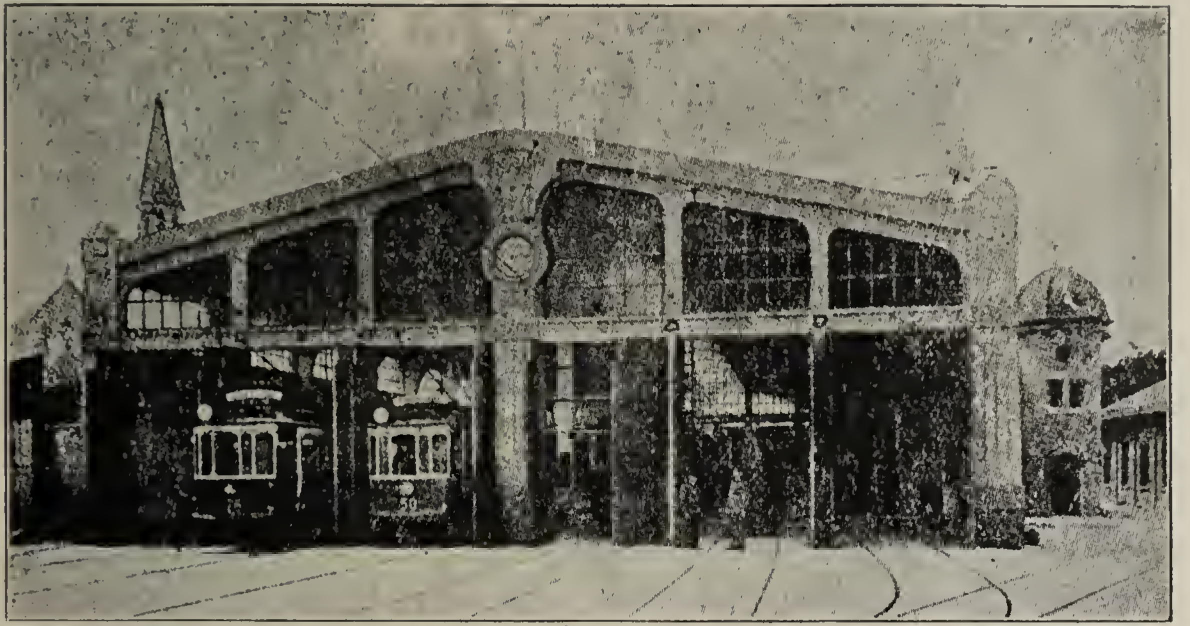

Fig. 1.—Concrete Street Car Depot, Nuernberg, Germany.

Fig. 1 is a front view of the structure which is 67 feet wide, 29 feet high from floor to the top of the roof from the center and 255 feet long. Fig. 2 is an interior view of the structure. Fig. 3 is a cross section, and Fig. 4 a longitudinal section through the center. The foundation piers were carried down to hard pan, and vary from 16 to 19 feet in depth. Fig. 5 shows the skeleton reinforcement of a hip roof, about 17 feet base by 6 feet high, glazed with wire glass, admitting light to the center of the building through its entire length. The front of the building above the doors is likewise glazed with wire glass. Fig. 6 shows the strains to which the building will be subjected. First by wind pressure, second by its own weight, and third snow pressure. Its own weight per cubic meter, 5,200 pounds; wind pressure, 264 pounds per square meter; snow pressure, 154 pounds per cubic meter. Fig. 7 shows the reinforcement of the columns, beams, girders and cross section of the center column. The side of the building above the windows is likewise glazed with wire glass. The prime object of this form of construction was an abundance of light, as well as stability, which was most economically obtained in reinforced concrete. The entire structure is at once clean and elegant in design, meeting the exact requirements called for by the municipal authorities and administration.—Tonindustrie Zeitung.

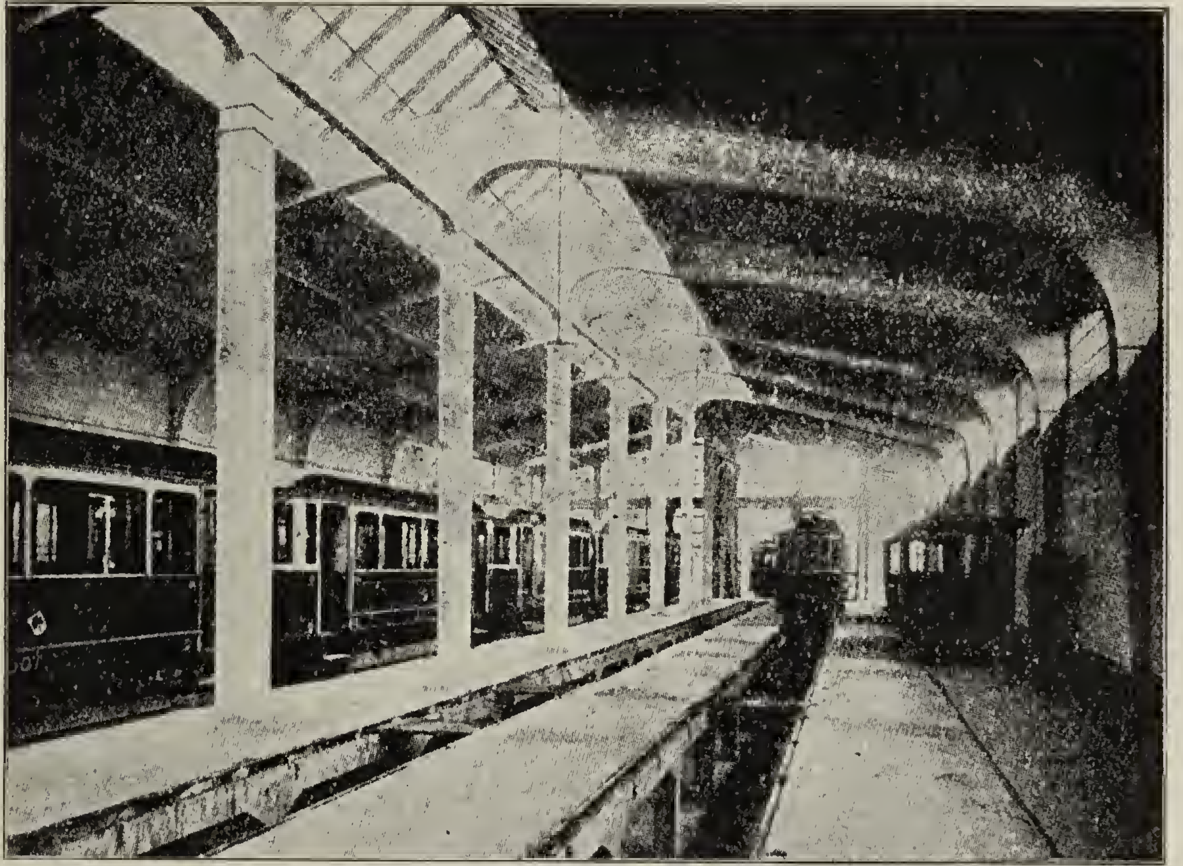

Fig. 2.—Interior View Street-Car Depot.

The steel ship, Socoa, 2,738 tons, gross, with a cargo of cement from Stettin, Germany, for San Francisco, was stranded on August 1st off the coast of Cornwall, England, and sprung a leak, wetting and breaking the cement packages, and thereby forming a perfectly solid mass, which will have to be blasted to remove it from the vessel's hold.

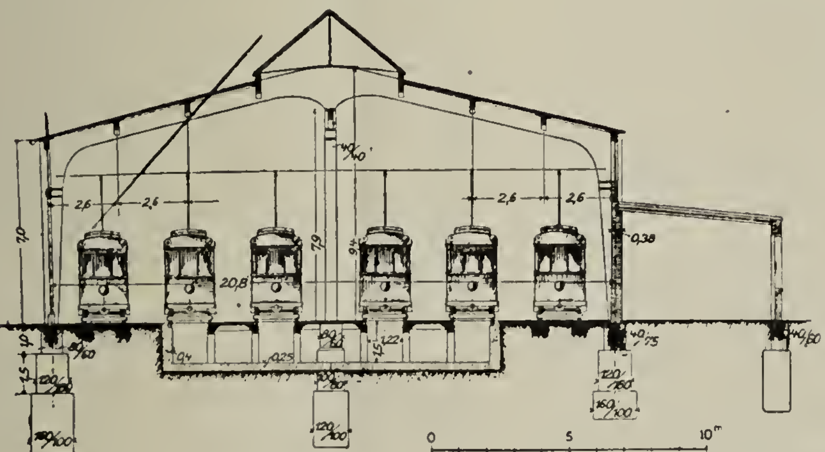

Fig. 3.

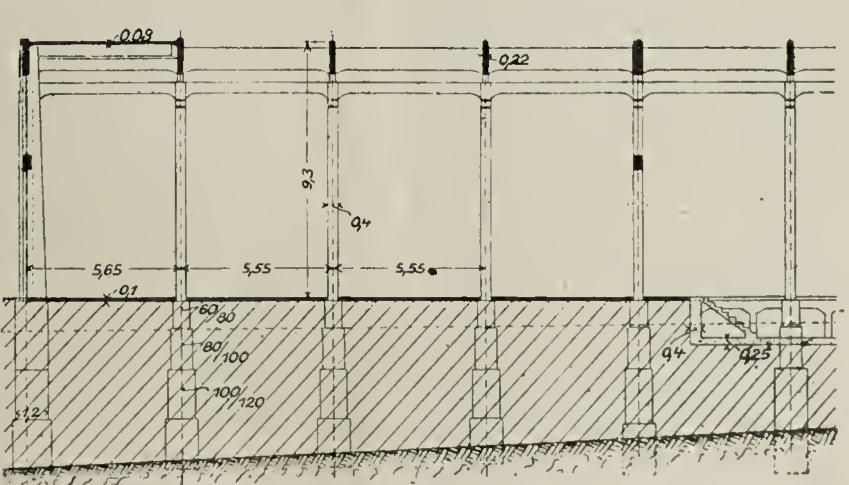

Fig. 4.

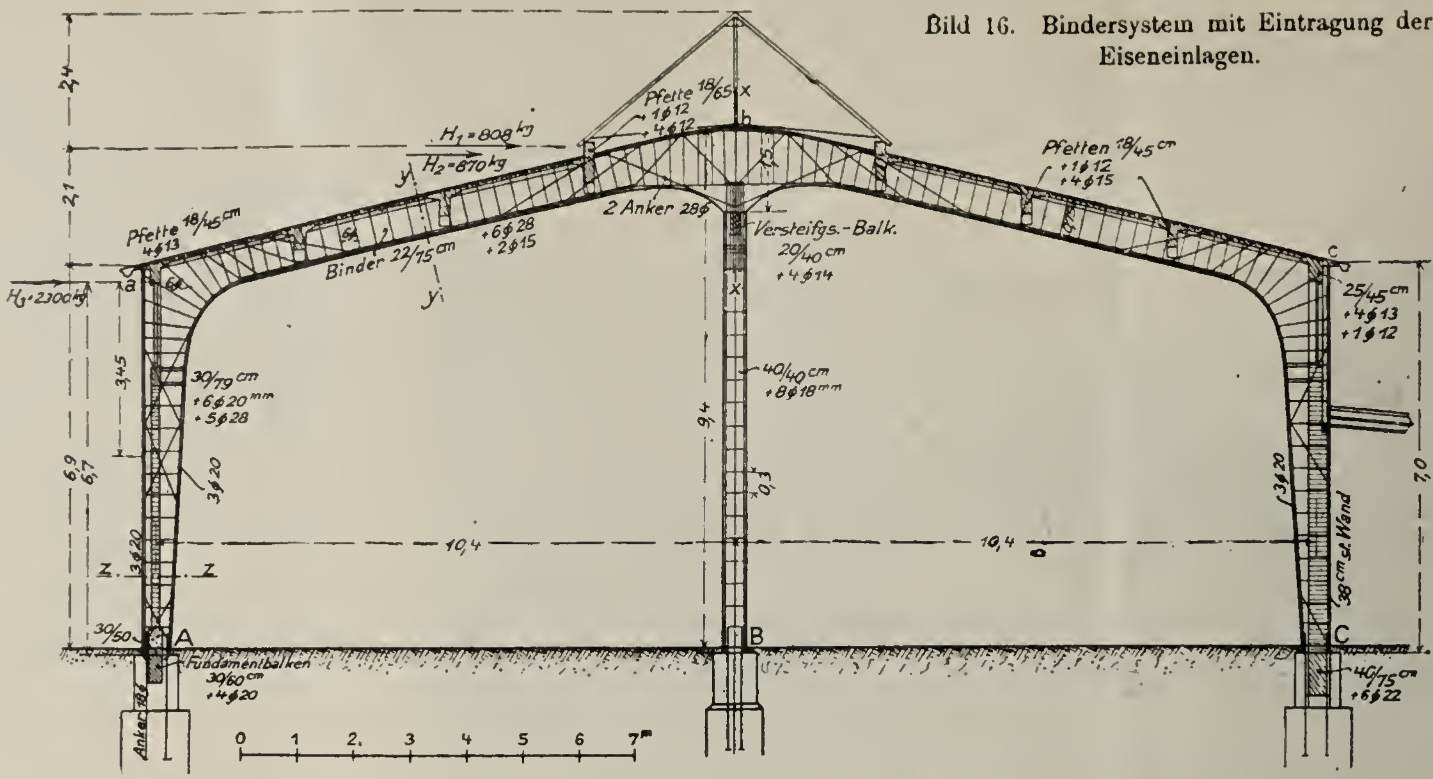

Fig. 5.—Arrangement of the Metal Reinforcement.

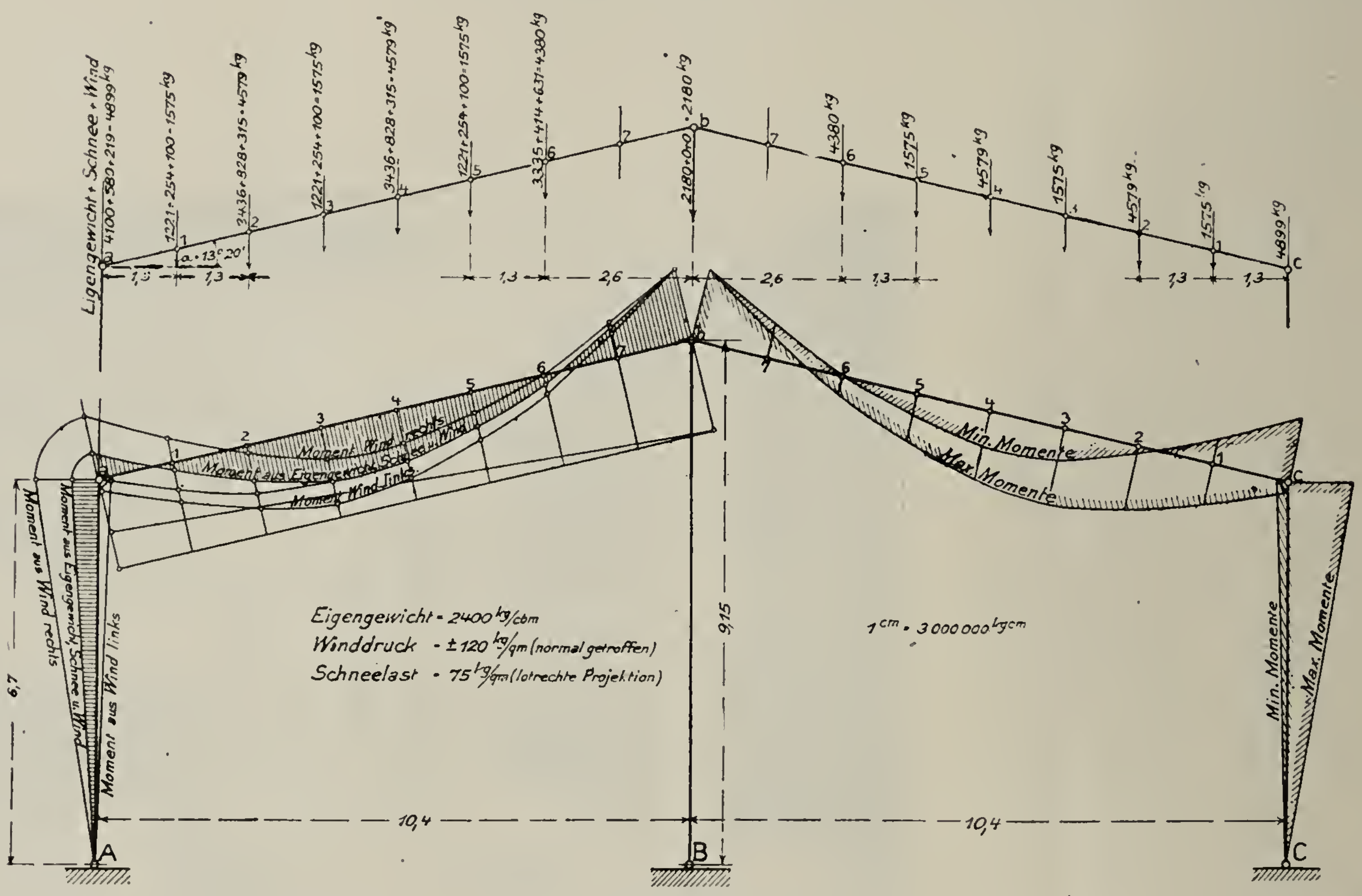
Eigengewicht + Schnee + Wind
Moment aus Wind links
Moment aus Eigengewicht, Schnee u. Wind
Moment aus Wind rechts
Min. Momente
Max. Momente
Eigengewicht = 2400 kg/cbm
Winddruck = ±120 kg/qm (normal getroffen)
Schneelast = 75 kg/qm (lotrechte Projektion)
1cm = 3 000 000 kgcm
α = 13°20'
9,15
6,7
10,4
10,4
A
B
C

Fig. 6.—Strain Sheet.

BRICKLAYERS AGAINST CONCRETE.

The union bricklayers in various parts of the country are taking action to prevent the use of concrete. Heretofore they have conducted strike after strike against its use because concrete is gradually displacing brick in many important structures.

Now comes the union bricklayers' convention of the state of New York and asks for positive legislation to limit and restrict its use for cement sidewalks and street foundations and such other construction work as will not interfere with the use of brick. This protest against the free use of concrete is simply a confession by the bricklayer that many persons prefer concrete to brick construction, and that the use of concrete in building construction is becoming a serious matter to the bricklayer. Yet nothing that the bricklaying fraternity can do will retard the growth of concrete construction.

REINFORCED CONCRETE CAR HOUSE.

The United Railways & Electric Co. of Baltimore will erect a large reinforced concrete building for sheltering its rolling stock. The structure will be one story high, 293 feet long, on Edmonson Ave., by 228 feet on Culverton road, to cost $100,000. It will contain 23 tracks. Twenty-nine skylights will be placed on the roof. Estimates are now being taken for the construction of the building by Simson & Pietsch, architects, of Baltimore.

AN OLD CONCRETE DWELLING.

The first concrete residence erected at Martins Ferry, Blemont County, Ohio, has just been torn down after standing over 40 years. The walls and other concrete work were found absolutely sound. The building was erected by the late James Kerr during the war. It was considered an experiment at the time by his neighbors. Several other concrete dwellings were erected in the same town that have been standing for nearly 40 years, all in good condition.

Imported cement is selling at Seattle at $3.50 per barrel. Cement or stone sidewalks only can be laid in Seattle hereafter.

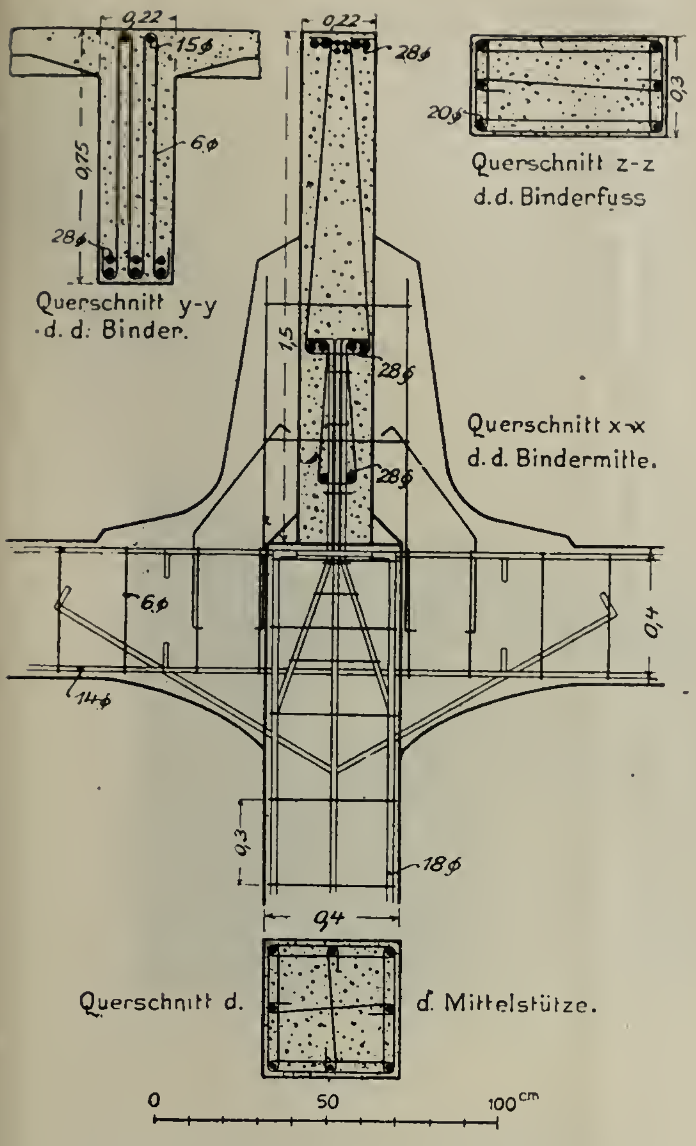

Fig. 7.—Details of Column and Rafter Reinforcement.

THE DETROIT PORTLAND CEMENT CO.

Flint, Mich., Sept. 25.—In the case of Rena E. Paine vs. the Detroit Portland Cement Co. of Fenton, Judge Wisner has appointed Lawson E. Becker of Fenton receiver. His bond was fixed at $20,000. This is the case in which the minority stockholders secured an injunction restraining the sale of the $200,000 plant by mortgage foreclosure, and which action was bitterly fought by Detroit attorneys who represented eastern capitalists. Subsequently, Judge Wisner approved the bonds of the receiver and granted a stay of proceedings, pending an appeal to the supreme court. The present management remains in control, until the supreme court decides the case, which will probably be some time next spring.

There were 84 sand lime brick plants operating in the United States in 1905, producing 119,131,000 common brick, valued at $783,702, average value $6.58 per thousand; 16,562,000 front brick, valued at $182,519, or $11.02 per thousand, and 198,000 fancy brick, valued at $4,338, or $21.91 per thousand, and sand lime blocks to the value of $1,505. The total value of this building material produced in 1905 was $972,064.

FIREPROOF HOUSES.

The New York building code is very strict upon the subject of concrete blocks, and apparently treats them with the greatest suspicion, believing that where there is such a chance to make poor blocks or blocks without a sufficient quantity of cement it is wiser to condemn them all at the start than to permit them to be used in such a manner as to jeopardize the lives of the inhabitants of the buildings.

Three sizes of blocks were used in the New Dorp house—12-inch for the basement walls, 8-inch for the walls above the basement, and 6-inch for interior partitions. The floors are supported by 2x10-inch concrete beams, reinforced with bars, and over these is laid a concrete floor in one continuous slab, having embedded in it nailing strips for the finished floor. Where partitions occur in the second story other than over first-story partitions they are carried by reinforced concrete girders, which show below the ceilings of the first story. The faces of these partitions, as well as the walls and ceilings, are in the main plastered with pulp plaster, which has a soft and pleasing effect and can be tinted or adapted to various applied decorations.

"Some of the walls are covered with burlap, tacked to half-inch strips, put in after the walls and partitions were completed. The house stands by itself on a large corner lot, the two principal sides being flanked by a terrace, the wall of which is built of blocks with rock faces. The front entrance is covered with a porch built entirely of concrete, the braces and roof being reinforced with plain round rods. On one side of the house is a veranda, the columns of which are built up of large blocks and carry a balustrade of interlaced blocks. On the same side of the house is a pergola, the columns of which are built up square, carrying rafters of small poles left with the bark on.

The roof is of a somewhat novel construction, the fireproofing system being also carried out here. The rafters are reinforced with bars over which is laid a slab of concrete, reinforced with plain round rods placed both vertically and horizontally on the roof surface. The slab forming the roof extends down to form a cornice, thus completing the frame without a single piece of wood. The gutters are formed in the roof by embedding a wire mesh bent to the proper angle and the concrete troweled around through this. The services of the tinner were required only for the running of the roof leaders. The steps of the rear entrance are cast in one piece in place, a few rods being sufficient reinforcement for the purpose. The interior stairs are also of concrete, and there are two cement fireplaces in the dining room. The house is as nearly fireproof as is possible.—New York Building Journal.

ASBESTOS LUMBER.

Asbestos building lumber is composed entirely of asbestos fiber and Portland cement, and is absolutely fireproof, as understood in building construction. It is also unaffected by moisture or frost and will not deteriorate in any way by contact with atmosphere or the elements in any way. It is found not only available but unequaled for all classes of light construction as well as roof coverings, for which it was primarily designed.

It is extraordinarily tough and hard. With age it becomes harder and impervious to the ravages of time or conditions of climate, moisture or atmosphere generally.

For park walks or pavements it may be used in thick slabs, and in these uses its indestructibility through exposure is greatly appreciated.

It is acknowledged by experts, architects, contractors and engineers who are intimate with its excellent properties that it has unequaled advantages as a building material because it does not disintegrate or exfoliate when exposed to fire or freezing; neither will it burst or fly to pieces when a stream of cold water is turned upon it while red hot, which proves that it is worthy serious consideration by architects as a suitable material for fire doors, partitions and fire-resisting structures generally. Fire underwriters indorse it unanimously.

The electrical and insulating qualities of asbestos building lumber are features which cannot be ignored by architects or engineers. Its insulating quality is very high for electrical resistance, and it is being largely used to insulate the electric installation under cars, so that "short circuits" may result without injury to car or occupants.

The corrugated sheathing may be applied in the same manner as corrugated iron—either laid directly upon the purlins in roofs and held in place by means of clips of hoop iron, which encircle the purlins and are placed in distances of about 12 inches apart, or they can be nailed to wood nailing strips.

Murphy, Miles & Sullivan, contractors for the new Columbus sewage disposal plant, have been authorized to use a coarser ground cement than that called for in the specifications for the work, provided the quantity of cement be increased in the mix.

TRACK ELEVATION IN CHICAGO.

The city of Chicago is the greatest railway center in the United States. Tracks enter the city through the thickly populated centers, crossing the streets at grade and resulting in numerous casualties to foot passengers, and to vehicles crossing at grade.

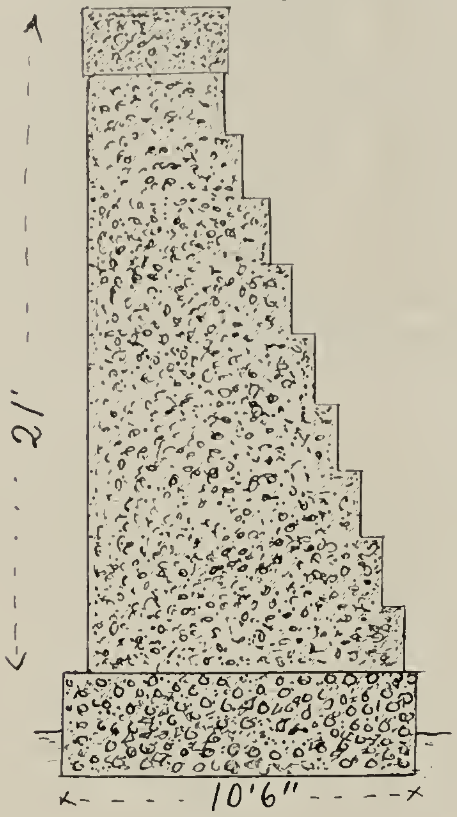

Fig. 1.

The number of people killed at these crossings in a single year in Chicago was greater than the number of passengers killed on all the railways in the United States. In order to prevent this great loss of life at grade crossings, the city of Chicago on May 23, 1902, passed its first ordinance for track elevation of 28 miles of track of the Illinois Central Railway, which was completed the same year, at the cost of $2,000,000, including 13 subways or street openings under the tracks. Up to April 6, 1905, there were 69 ordinances calling for the elevation of 153 miles of the right of way in the city including railway yards. Upon this right of way 746 miles of single track will be laid, pierced by 576 subways to be built by individual roads, besides 250 joint subways to be built by two or more roads jointly. The cost of the entire work is estimated at $48,910,250, of which $28,725,250 has been expended up to April 6, 1905. Up to 1895 much of the masonry retaining walls was built of dimension and rubble stone, especially by the Lake Shore and Michigan Southern Railway and the Rock Island Railway in charge of Col. Clark, engineer of erection.

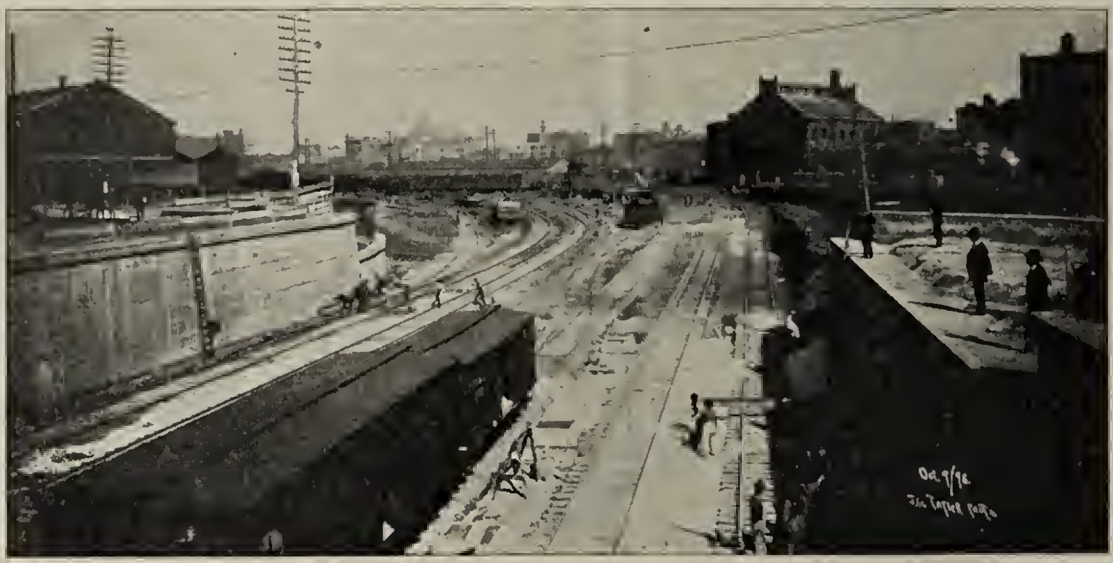

Fig. 11.

Much of the stone masonry retaining walls on these two roads was done under political pull or fear of adverse legislation. Col. Clark informed the writer that he really preferred concrete. Very little stone masonry is now going into track elevation in Chicago. Concrete being substituted. The concrete retaining walls erected by the Pittsburg, Fort Wayne and Chicago Railway, between 23d and 55th streets, a distance of about 3¼ miles including a number of street intersection foundations cost $1,000,000. Fig. 1 is a cross section of a concrete retaining wall at 16th and Clark streets. Fig. 2 is a concrete retaining wall on the Chicago & Northwestern Railway at Laflin street crossing.

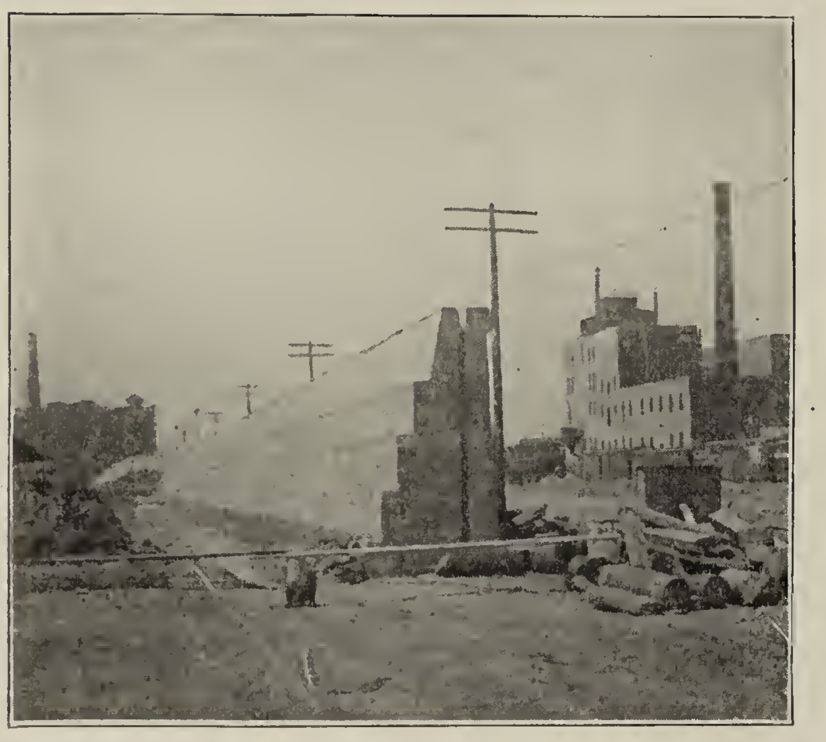

Fig. 2.

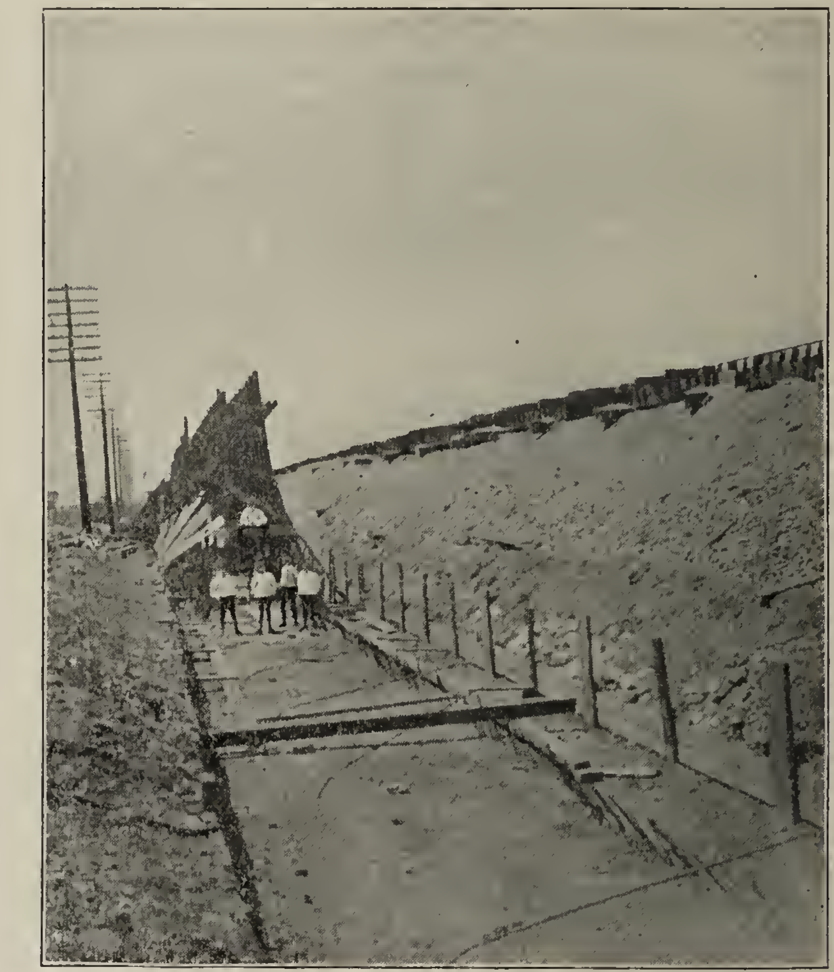

Fig. 3.

Fig. 3 shows the concrete footings in place with the false work in the distance in which the retaining walls will be formed. The footing is bonded to the upper section of the wall by a line of iron rods shown on the right of the view projecting up out of the foundation. Fig. 4 shows the false work on an extra high section of wall with a track and car above loaded with concrete ready to be deposited in the wall. Fig. 5 is a concrete retaining wall at a street crossing on the

C., B. & Q. Ry. Fig. 6 is a concrete mixing outfit mounted on a car and a depositing bucket. The bucket receives the concrete directly from the discharge end of the concrete mixer, after which it is elevated and contents deposited in the form and tamped. The inside of the retaining wall is shown. Fig. 7 shows the road-bed between the retaining walls which space will be filled with sand and gravel even with the top of the wall. Fig. 8 is another view of a section of road-bed and tracks with finished retaining walls. The road-bed is gradually being filled and the tracks raised. Enormous amounts of material are required to fill in the right of way, which has an average width of 100 feet to 200 feet, while the company's yards in places are 400 feet wide, and from 12 to 15 feet high. The Pittsburg, Ft. Wayne & Chicago Co.'s yards from 47th street to 55th street required from 150 to 175 carloads of sand daily, from May 7, 1903, to April 6, 1905, after which the fill was only two-thirds completed. Fig. 9 shows the fill being made. Fig. 10 shows a section of track in which the fill is about completed. Fig. 11 shows the track elevation at 16th and Clark streets, at which point about 800 trains pass over this section between 6 a. m. and 12 p. m. daily, with over 4,000 cars. One thousand one hundred street cars, with more than 20,000 passengers cross at this point every eighteen hours. During the full twenty-four hours nearly 6,000 cars pass this point daily. After the Chicago track-elevation scheme has been completed, 818 subways will have been provided under the right of way of the twenty-three railway companies entering Chicago. Inasmuch as concrete is almost exclusively used in track elevation in Chicago, vast quantities of Portland cement are consumed in the work. The entire system of track elevation has for its end and aim the saving of human life and the protection of property in transit over the streets of Chicago. At the same time it enables the companies to increase the speed of trains, and thus save time in entering and leaving the city. The ordinances of the city for this work have been carried out under the supervision of John O'Neill, expert on track elevation, who has represented Chicago from the inception of the undertakings to the present day; a duty which he has well and truly performed.

An Episcopal church building will be erected at Little Rock, Ark., of concrete building blocks.

Little Rock laid 39,446 lineal feet of cement walks during the present season.

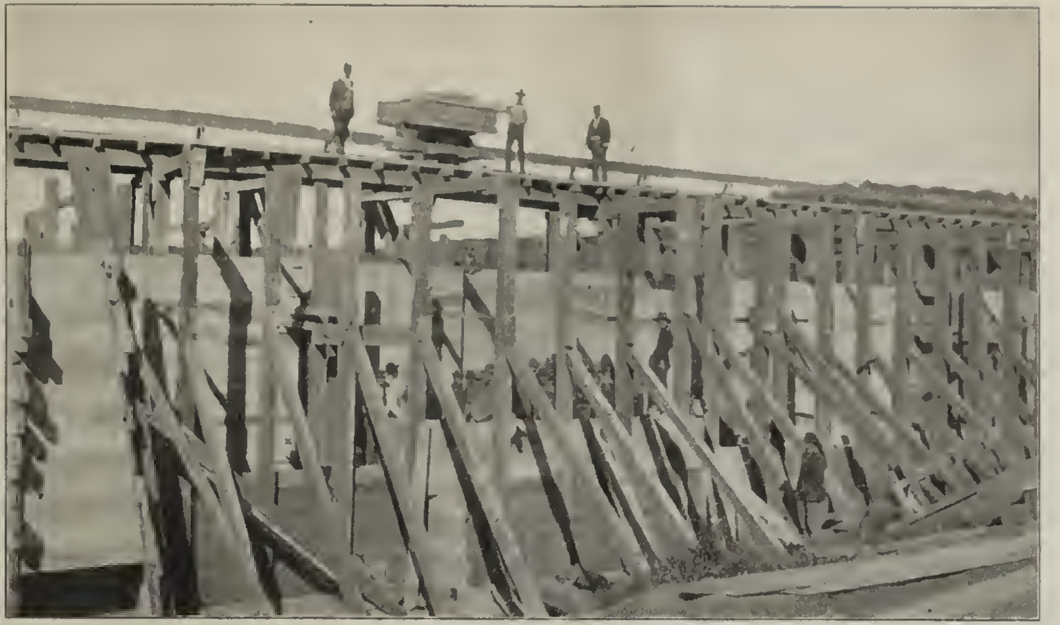

Fig. 4.

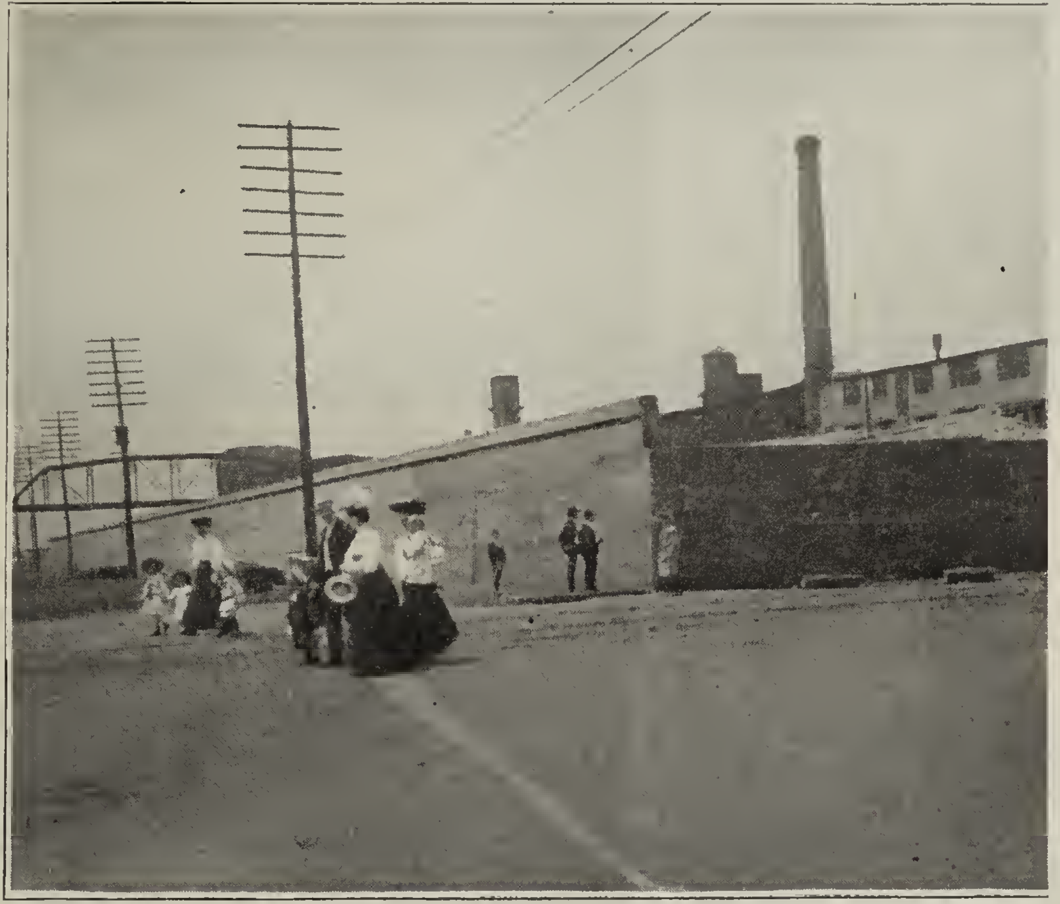

Fig. 5.

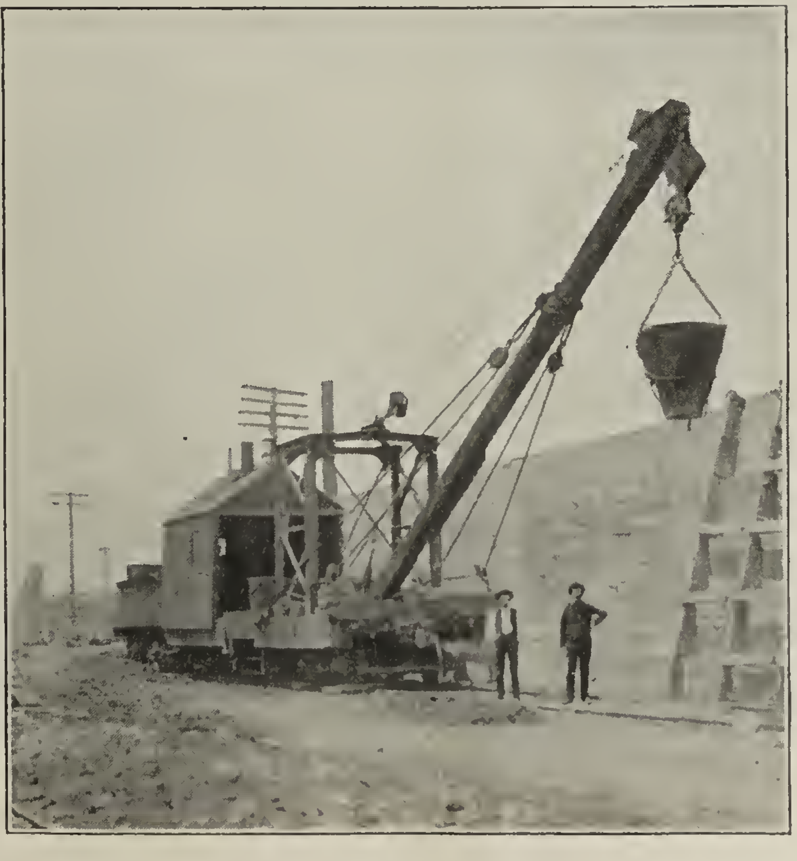

Fig. 6.

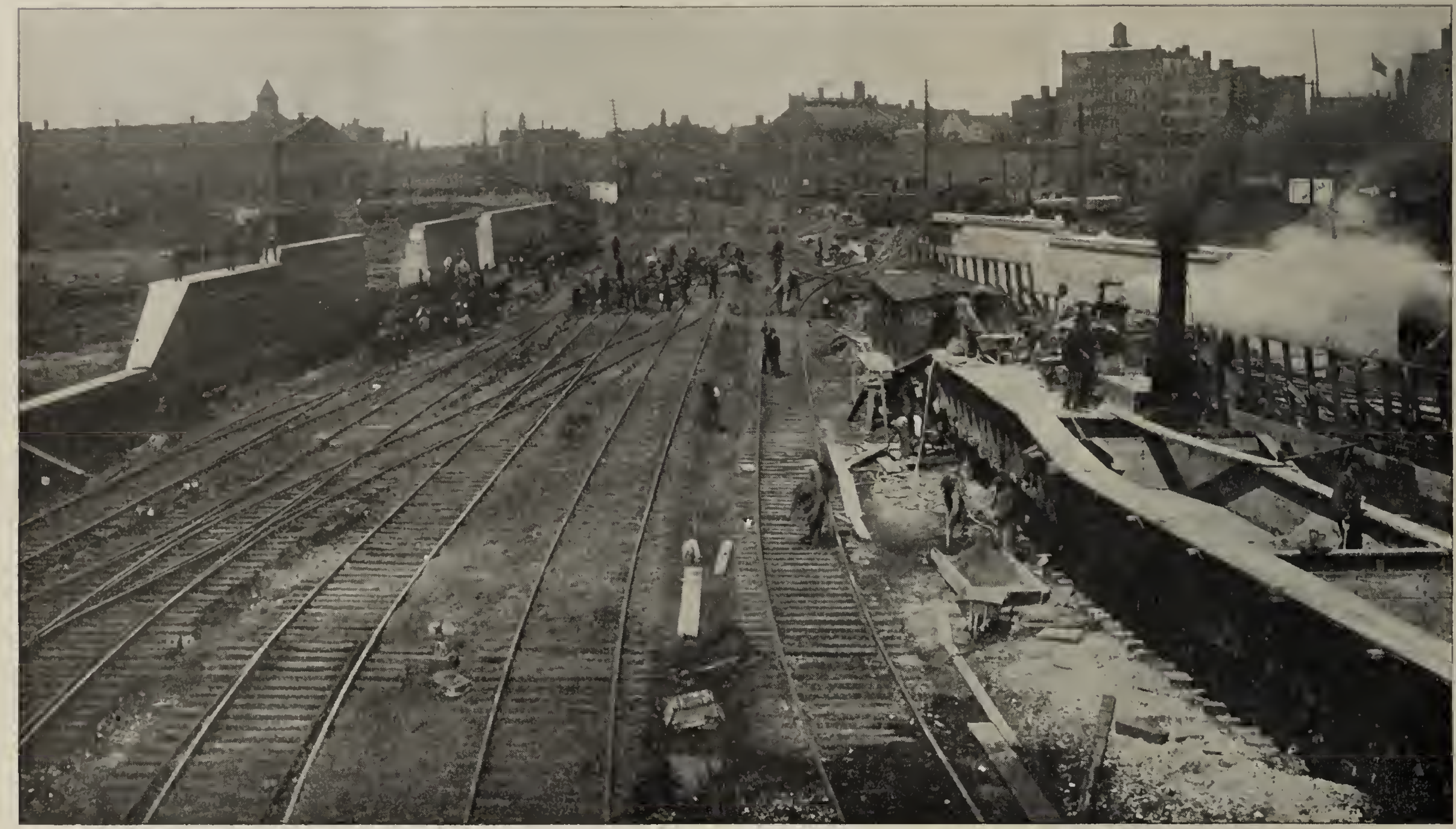

Fig. 7.

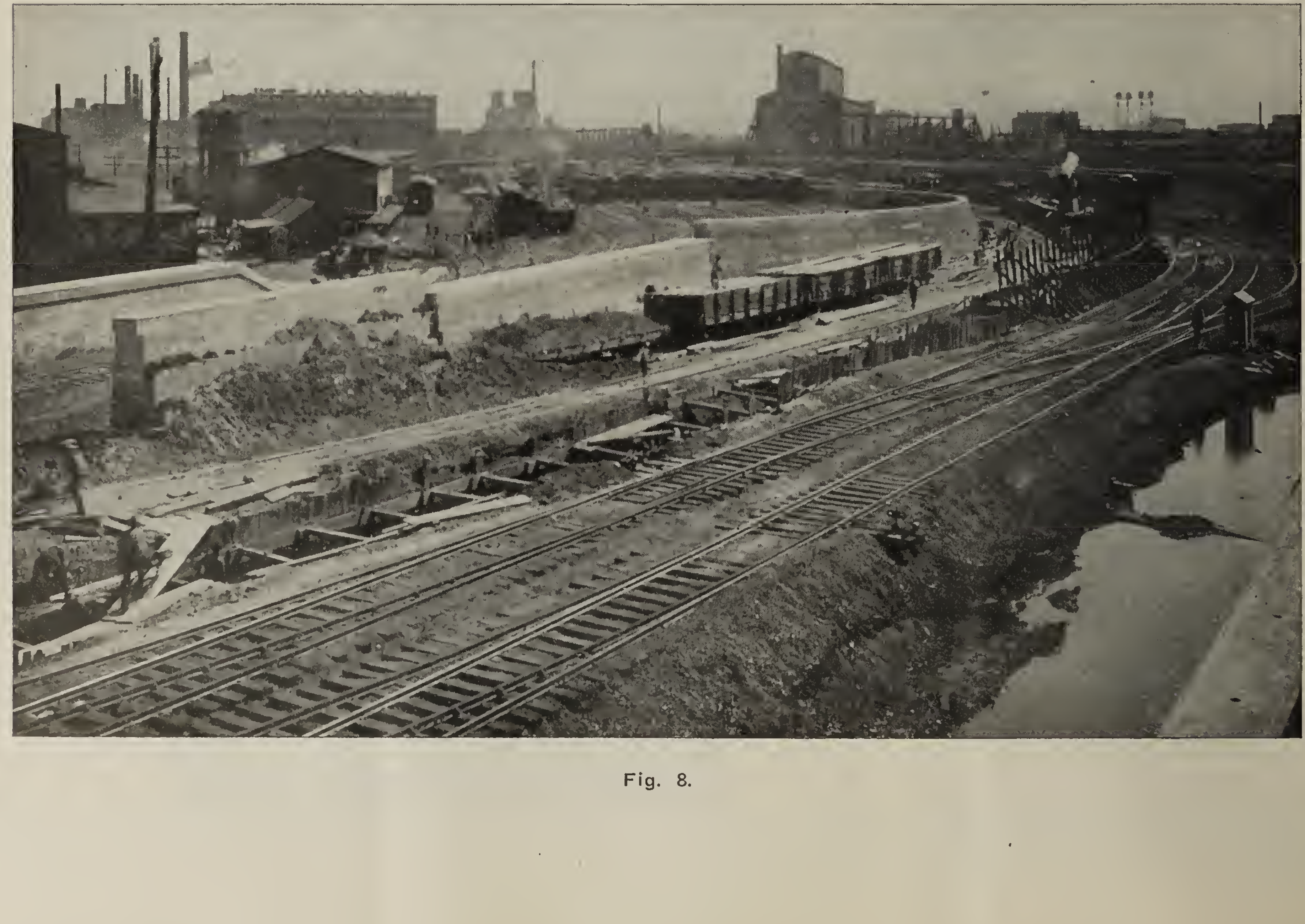

Fig. 8.

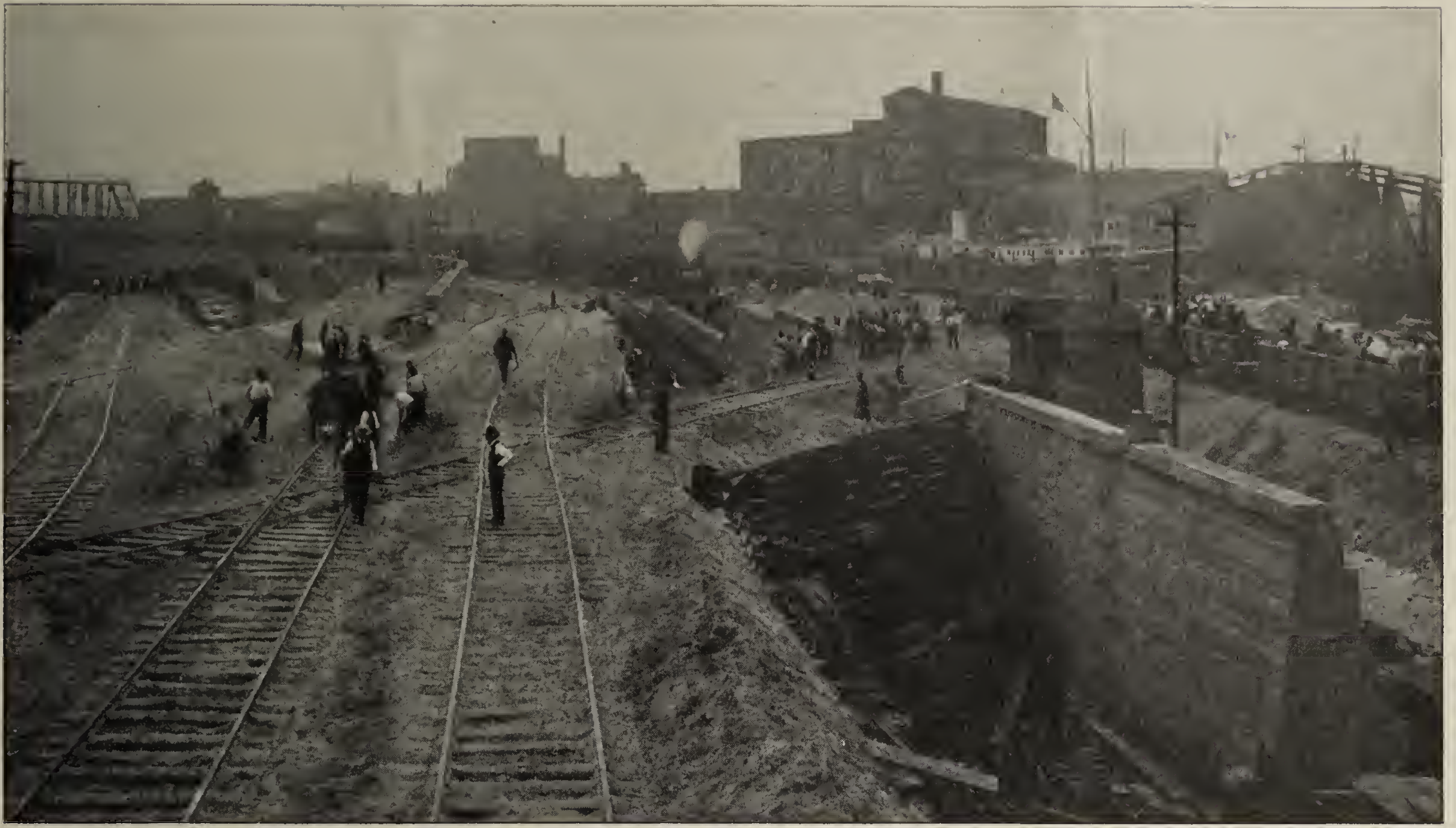

Fig. 9.

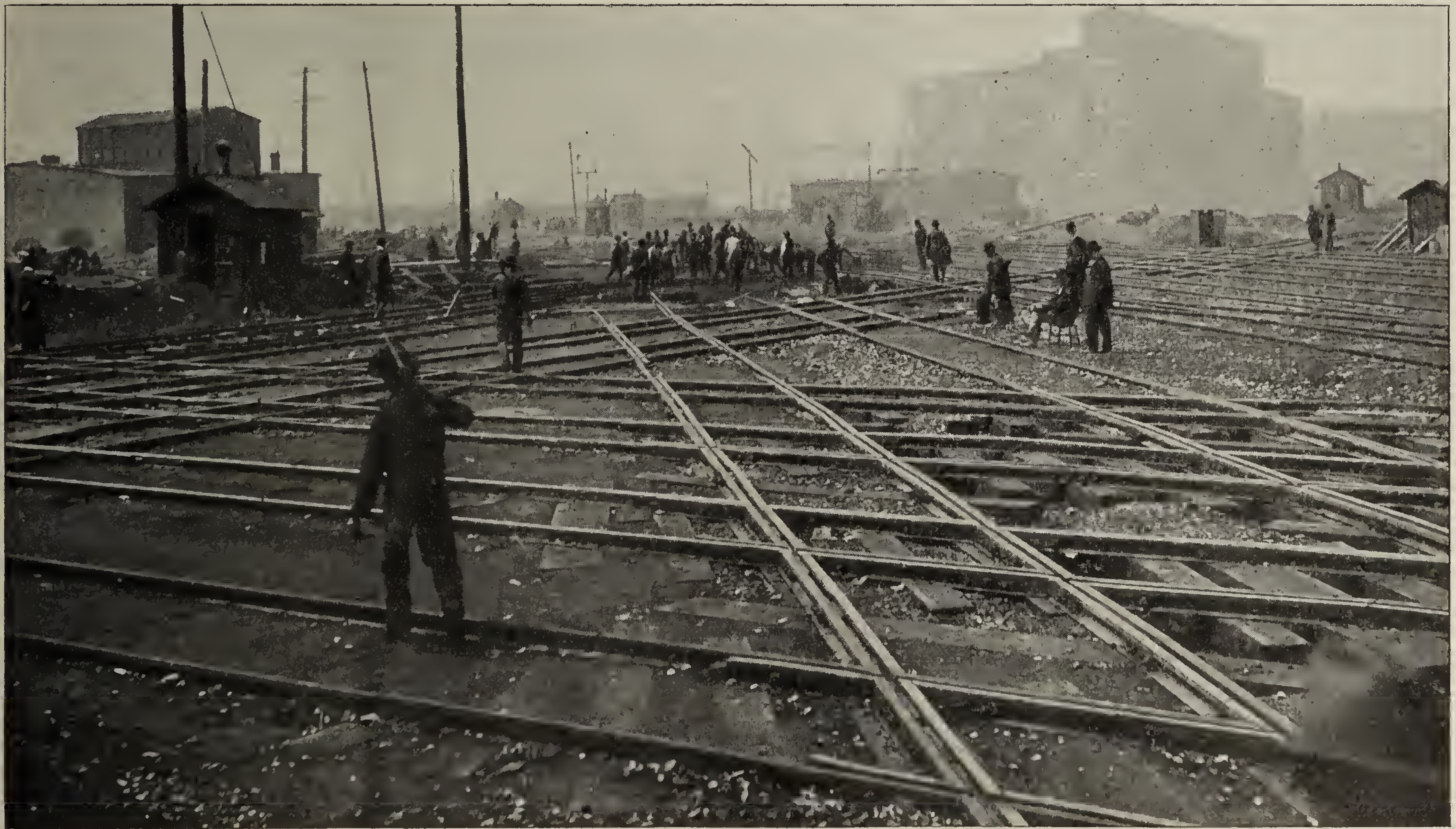

Fig. 10.

STATISTICS OF CEMENT INDUSTRY IN 1905.

BY L. L. KIMBALL.

(Continued from August issue.)

THE NATURAL CEMENT INDUSTRY, BY STATES.

In all the States given below there are cement plants erected for the purpose of producing natural cement, but in 1905 only a certain percentage of these plants were operative. Where a factory has been reported as having no prospect of again engaging in the business of producing this variety of cement, it has been dropped from the number of works given in the tables; but where it is reported simply as idle, and there are chances that it will become productive again, it is retained in the count. Thus, in Ohio there are in reality two plants which are well equipped for the production of natural cement. But in one case there is no immediate prospect that the plant will be active again. In consequence, Ohio has but one plant reported for this production. In Nebraska, on the contrary, although the single plant there is a natural cement plant which has been inoperative for some years, there is no talk of abandoning the mill, and it may become active again at any time. Therefore it is included in the number of plants given.

Following are detailed accounts of State productions:

Florida.—The reports from Florida for 1905 is very definite, and states that there is now no plant for the manufacture of cement at River Junction, and that none will be erected there for the production of natural cement. If the large deposit of limestone which occurs there is utilized for producing cement, a factory will be erected for the purpose of manufacturing Portland cement.

Georgia.—This State is distinctive in that it is the only one from which a new plant for the production of natural cement is reported in 1905. The new factory was started in September and ran satisfactorily during the remainder of the year. The two older factories were both active the entire year, except for a month's idleness in one for necessary repairs. In the other plant the full number of kilns was not fired because of a scarcity of labor. The total production of natural cement in the State, however, was noticeably larger than that for the preceding year.

Illinois.—The production of natural cement in Illinois in 1905 exceeded the output for 1904 slightly, though two of the three manufacturing factories ran behind their productions for the previous year. The third plant more than doubled its output, however, which increased the total production sufficiently to more than balance the shortage. One of three plants ran throughout the year, another was idle three months making repairs, and the third ran on less than full time.

Indiana.—The record of this State for 1905 is comparatively small. There were 12 mills equipped for manufacture, but most of them were idle. Many of the companies report inactivity because of a lack of orders, and several of them are considering a radical change in their equipment. One plant which is located at Charlestown has already been sold to a western company, and will be overhauled and remodeled in such a way as to admit of the manufacture of Portland cement. The materials for such a production are abundant on this property, and the rebuilding will be started in 1906. The quantity of natural cement manufactured in the Louisville district in 1905 was not so far below that for the preceding year as might have been expected, but the sales were not very ready, and at the close of the year there were more than 100,000 barrels of cement left unsold in the stock houses.

Kansas.—In this state the production of natural cement, which has for many years been successfully carried on, ran ahead of that for the preceding year. The older of the two plants which manufactured natural cement had an output considerably larger than that reported for 1904 and ran throughout the year. The other plant was idle during a part of the year, the production being not quite equal in size to the one recorded in 1905.

Kentucky.—Both the natural cement plants in Kentucky were active in 1905, though neither of them ran continuously through the year. Much of the cement credited to the Louisville district is made by these mills for the smaller plants, and they are both well equipped and well located for the work. Their output in 1905 was somewhat smaller than that for the previous year.

Maryland.—Of the four mills that have for years reported a production of natural cement from this state, but two were active in 1905, and they had comparatively small outputs. The lack of demand for natural cement was felt in the Cumberland district as in other centers for the natural cement production. One of the active plants in Maryland ran only a few months and the other ran but little more than half the year. Of the two idle plants, one is closed down permanently and the report of the other shows that the company is engaged in erecting a Portland cement plant, but that it is not yet completed. Another of the natural cement plants may also be converted into a factory for the production of Portland cement, as the materials on the property owned by the company are adapted to such a project. The plan is under consideration, but has not yet been definitely decided on.

Minnesota.—In this State the record for 1905 is practically a duplicate of that for the previous year. There were two plants producing natural cement; both were closed down for a part of the year; one mill ran ahead of its output for 1904 and the other fell slightly behind. The lack of orders for the natural product was not so sharply felt in this section of the country as it was in the eastern States, where cement plants are not so scattered.

Nebraska.—There has been but one cement plant in this State, and that has produced only cement of the natural variety. In 1905 the mill was idle, and it has been so for several years past. There is a prospect that the mill will be active again, but the time of firing the kilns is not stated.

New York.—The production of natural cement was larger in the Rosendale district in 1905 than it was in 1904, notwithstanding the depressed conditions in that branch of the cement industry. Seven of the plants that make natural cement were inactive in 1905, but a number of the producing factories had outputs which were in advance of those made in the previous year. One plant was idle practically all the year undergoing extensive alterations, but will probably be active in 1906. The consolidation of a number of natural cement producing companies, which occurred several years ago in the Rosendale district still holds, and the combined companies reported a production decidedly in advance of their output in 1904. One of the old, well-established plants was idle because of the death of the owner, and it is doubtful if the kilns will be used again for making cement. There are no new plants for the production of natural cement reported from New York in 1905.

North Dakota.—The change of stockholders made in 1905 in the plant which produces the only cement made in North Dakota caused several months' idleness in the works during the fall of the year. The season through which cement can be profitably made in this climate is not so long as it is in warmer places, and owing to this and the inactivity mentioned the production of cement in this State was not so large as that for the year preceding. Large improvements and the installation of new machinery are being talked of for this plant, which has a large field in which to exploit its production, however ample.

Ohio.—Although there are two plants in this State that are equipped for manufacturing natural cement, but one of them was a producer in 1905, and it ran ahead of its output for 1904. This plant has steadily increased its production each year and usually is run continuously throughout the season. Such was its record for 1905. The other plant, which has been closed for several years, may be dismantled or may stand idle for many years.

Pennsylvania.—There are no cement plants used exclusively for producing natural cement in Pennsylvania. All such cement is manufactured by factories also engaged in making Portland cement. In 1905 four of these plants were actively producing natural cement, and the fifth one, that has the machinery to admit of such a production, stood idle. Of the four active mills, three had outputs of natural cement that were smaller than those made in 1904, while the other factory increased its output. All the mills ran practically on full time through the year, the only stoppages occurring in order that small but necessary repairs might be made. The total State production of natural cement was not so large as that for the previous year.

Texas.—The only plant which produces natural cement in Texas was active in 1905 and ran continuously through the year. It produced an output considerably in excess of that made in the preceding year, but not so large as that made in 1903. This plant has been a successful one for years, and has no record of any long period of inactivity since it was built. There is another plant in the State which was formerly devoted exclusively to the manufacture of natural cement, but it has not been operated for several years. The third cement factory in Texas was remodeled and made into a Portland cement plant two years ago, since which time it has produced that article.

Virginia.—There were two active natural cement plants in the State of Virginia in 1905. Of these two, one had a production slightly in advance of that made the previous year, and the other manufactured less than a fifth of the quantity made in 1904, being active only about two months. Both plants suffered from the fact that orders were lacking, and give the usual report that the demand was mostly for Portland cement.

West Virginia.—The natural cement industry in West Virginia was not a thriving one in 1905. The plants in the State that usually produce this variety of cement were idle all the year, and one of them was offered for sale.

Wisconsin.—The two plants operating in this State in 1905 produced only natural cement and were active during the season. One of them produced an output in advance of that made the previous year, and the other ran very far behind the quantity made in 1904. The total cement production of the State is less than the total production of a year before, the failing demand for natural cement having caused a lack of orders here, as in many other States.

PUZZOLAN OR SLAG CEMENT.

The growth in the slag cement industry is slow, but the number of plants for producing it gradually increases. In 1905 Kentucky was added to the list of slag cement producing States, and the erection of a large plant at Buffalo will add still another State to that list in 1906. The new plant is located on the property of the Union Furnace Company, and will be built by the same people who designed and erected the new slag cement plant at Ashland, Ky.

PRODUCTION.

As in previous years, only two States had more than one slag cement plant in 1905. For that reason it is impossible to classify each State and give a table of production in detail. In the combinations made for the purpose of concealing individual figures of production, Alabama and Illinois totals are added and the result is placed against Illinois, as this State reported the larger production; and Maryland, Pennsylvania, Ohio, New Jersey and Kentucky totals are given, together with the resulting product placed against Ohio for a like reason.

Following is a table showing the total production of puzzolan or slag cement in the United States in 1905, together with the number of plants.

Production of slag cement in the United States in 1904 and 1905 by States.

[Barrels.]

State.	1904.			1905.		
	Number of works.	Quantity	Value	Number of works.	Quantity.	Value.
Alabama	2	187,677	$141,402	2	.	....
Illinois	1	....	....	1	106,236	$80,616
Kentucky	....	....	....	1	..	....
Maryland	1	....	....	1	....	....
New Jersey	1	....	....	1		....
Ohio	2	115,368	85,249	2	276,211	191,998
Pennsylvania	1	.		1	.	....
Total	8	303,045	226,651	9	382,447	272,614

THE PUZZOLAN CEMENT INDUSTRY, BY STATES.

Accounts in detail of each State which contributed to the entire quantity of slag cement made in the United States in 1905 are as follows:

Alabama.—The conditions prevailing in the State of Alabama in 1905 were nearly the same as those that obtained in 1904. There were two plants actively engaged in producing puzzolan cement. These two plants are owned by different companies, but one company leases the plant of the other and has operated both factories for several years. The output of cement was not so large as that for the preceding year and the plants were closed for a part of the season.

Illinois.—There is but one puzzolan cement factory in this State, and it is operated by the Illinois Steel Company. In 1905 the plant at North Chicago was active in producing a quantity of slag cement intended solely for use by the company in its construction work. For certain parts of the work it has found puzzolan cement entirely satisfactory. It has, however, abandoned the production of this cement for commercial purposes and reports that if there was no construction work being done by the company there would be no slag cement made by it and the mill at North Chicago would be dismantled or fitted for use in manufacturing Portland cement only. The slag cement plant was active only a part of the time, and its production was somewhat less than that made in 1904.

Kentucky.—Late in 1905 the only slag cement in the State was finished and became active, reporting a small production. This plant is built at Ashland, Ky., by the Ashland Iron and Mining Company and is claimed to be the finest slag cement plant in the country. The buildings are of concrete block construction, with all the foundations both for machinery and buildings made from a slag cement—sand-crushed-cinder concrete. The mill has a capacity of 550 barrels per days, and the stock house is provided with bins capable of holding 15,000 barrels of cement. The cement is ground to such a degree of fineness that 95 per cent of it will pass through a 200-mesh screen. There are three Ruggles Coles driers 30 feet long by 5 feet 10 inches in diameter, and four tube mills 22 feet long by 5 feet in diameter. Fuel for the driers is furnished from the collieries owned and operated by the company, and blast-furnace gas is used to generate steam for power. The pit for granulating the hot slag is made of slag cement and crushed cinder concrete and is 21 feet wide, 40 feet long and 25 feet deep. There are chemical and physical laboratories, both of which are well equipped with the most modern apparatus for cement testing. A characteristic chemical analysis of the Ashland puzzolan cement is as follows:

Analysis of puzzolan cement from Kentucky.

Silica	35.72
Iron oxide	.84
Alumina	9.72
Lime	45.42
Magnesia	2.85
Sulphur	1.42
Loss on ignition	3.66
Undetermined	.37
	100.00

Maryland.—There is but one company in this State which produces puzzolan cement and its plant was idle nearly half the year in 1905. The output of the factory was larger than that for 1904, but fell short of its averages for five years prior to that time.

New Jersey.—Only one plant in this State produced slag cement in 1905, and it was active during only a part of the year. The demand for this kind of cement was not large enough to make greater activity necessary in this section of the country. The production was smaller than that reported in 1903. In 1904 the mills were closed down and the site of the factory was changed.

Ohio.—The year of 1905 was a prosperous one for the slag cement industry in Ohio. This State has two plants producing puzzolan cement and both were active, though neither ran continuously through the year. The older plant closed down for a short time, because of a lack of orders, but even so it almost doubled its output for the year previous. The newer mill was obliged to close down for necessary repairs and some small remodelinig of part of the plant, but it made an output which more than doubled its production for 1904, which was a large one.

Pennsylvania.—The single puzzolan cement factory in the State of Pennsylvania reported its third and largest production in 1905. The company did not operate these mills continuously, because of the cold weather, but the entire output for the year was nearly twice as large as that for 1904.

KILN REPORT FOR 1905.

The latest report on the approximate number and variety of kilns in the cement plants of the United States made by this Bureau was in 1902.

At that time the number reported was much smaller than it now is, though the increase in the use of the rotary kiln was then strongly marked. At the present time nearly all the Portland cement in this country is burned in rotary kilns, there being in 1905 only three factories reporting productions of Portland cement burned in vertical kilns.

The increase in the establishment of rotaries within the last three years is shown approximately in the following table:

Number, kind, and condition of kilns in 1902 and 1905.

Kind.	1902.			1905.		
	Active.	Idle.	Building.	Active.	Idle.	Building.
Vertical	611	76	6	395	116	....
Rotary	456	9	46	722	23	42
Total	1,067	85	52	1,117	139	42

IMPORTS AND EXPORTS.

IMPORTS.

The total quantity of hydraulic cement brought into the United States from foreign countries in 1905 was 846,577 barrels. The total quantity withdrawn for consumption was 896.845 barrels. For the first time in the history of cement in this country the quantity of cement imported from foreign countries is smaller than the quantity withdrawn from warehouse during the year for consumption, the difference being 50,268 barrels.

Following is a table showing imports of all hydraulic cements into the United States, by countries:

Imports of hydraulic cement into the United States in 1902–1905, by countries.

[Barrels.]

Country.	1902.	1903.	1904.	1905.
United Kingdom	79,087	146,994	16,365	33,978
Belgium	615,794	737,576	394,368	335,154
France	14,922	14,866	34,912	18,864
Germany	1,259,265	1,377,414	585,563	456,325
Other European countries	18,654	27,415	7,538	602
British North America	3,612	4,421	566	417
Other countries	4,154	9,265	7,091	1,237
Total	1,995,488	2,317,951	1,046,403	846,577

RELATION OF DOMESTIC PRODUCTION AND CONSUMPTION TO IMPORTS.

In the following table is shown the increase, by years, in the production of Portland cement in the United States, the increase and decrease of the natural cement, and the variations in imports for consumption of hydraulic cements into this country, since 1900:

Comparison of production of Portland and natural-rock cement in the United States with imports for consumption of hydraulic cement, 1900–1905.

[Barrels.]

Year.	Natural cement.	Portland cement.	Total of natural and Portland cement.	Imports.
1900	8,383,519	8,482,020	16,865,539	2,321,416
1901	7,084,823	12,711,225	19,796,048	922,426
1902	8,044,305	17,230,641	25,274,949	1,963,023
1903	7,030,271	22,342,973	29,373,244	2,251,969
1904	4,866,331	26,505,881	31,372,212	968,410
1905	4,473,049	35,246,812	39,719,861	896,845

This table does not include the production of puzzolan cement, which has been recorded in this Bureau since 1901, and is as follows: 1901, 272,689 barrels; 1902, 478,555 barrels; 1903, 525,896 barrels; 1904, 303,045 barrels, and 1905, 382,447 barrels.

Figures showing the imports and exports of cement to and from this country have never been divided into detailed statements as to Portland, natural or puzzolan cement. They are received at the Bureau of Statistics as "hydraulic cements," undivided into classes, and are thus forwarded to this Bureau. Therefore the comparison in the following table can not be made between domestic Portland and imported Portland, but must be made between domestic Portland and all imported hydraulic cements. The table shows a comparative statement of the production of Portland cement in the United States and of the entire quantity of hydraulic cement imported into and consumed in the United States in 1891, 1901, 1904, and 1905:

Comparison of domestic production of Portland cement with consumption of Portland and all imported hydraulic cements, 1891, 1901, 1904, and 1905

[Barrels.]

	1891	1901	1904	1905.
Production of Portland in the United States	454,813	12,711,225	26,505,881	35,246,812
Imports (entered for consumption)	2,988,313	922,426	968,409	896,845
Total	3,443,126	13,633,651	27,474,290	36,143,657
Exports (domestic)		417,625	774,940	897,686
Consumption	3,443,126	13,216,026	26,699,350	35,245,971
Percentage of production of Portland to consumption in the United States	13.2	96.2	99.2	100

For the first time the percentage of production of Portland cement to consumption of Portland and of imported cement in the United States exceeds 100. The increase of exports and the decrease of imports is very clearly marked in 1905.

EXPORTS.

In 1905 the quantity of domestic cement sent out of this country amounted to about nine-tenths of a million barrels, which is the first time exports have reached such a mark. The shortage in cement from which some sections of the country suffered, the ever increasing uses to which cement is put, and the state of foreign markets did not suffice to check the growth in the exporting of American cement. This is a field which has not hertofore been sufficiently exploited, and the figures for 1905 show a most encouraging change.

The total quantity of hydraulic cement, both domestic and foreign, sent out of the country in 1905 was 897,686 barrels. Following is a table showing exports of domestic hydraulic cement since 1900:

Exports of domestic hydraulic cement, 1900–1905.

[Barrels.]

Year	Quantity.	Value.	Year.	Quantity.	Value.
1900	100,400	$225,306	1903	285,463	$433,984
1901	373 934	679,296	1904	774,940	1,104,086
1902	340,821	526,471	1905	897,686	1,387,906

The total apparent consumption of all hydraulic cement in the United States in 1905 amounted to 40,101,467 barrels.

Fig. 1 is a graphic illustration designed to show the growth of the production and of the apparent consumption of hydraulic cement in the United States, and the decline of the imports of foreign hydraulic cements, since 1890. The diagram includes all hydraulic cement, so far as the figures are recorded in this Bureau. Prior to 1900 a record of production of slag cement was not kept, and therefore slag cement is not included in the total production previous to that year.

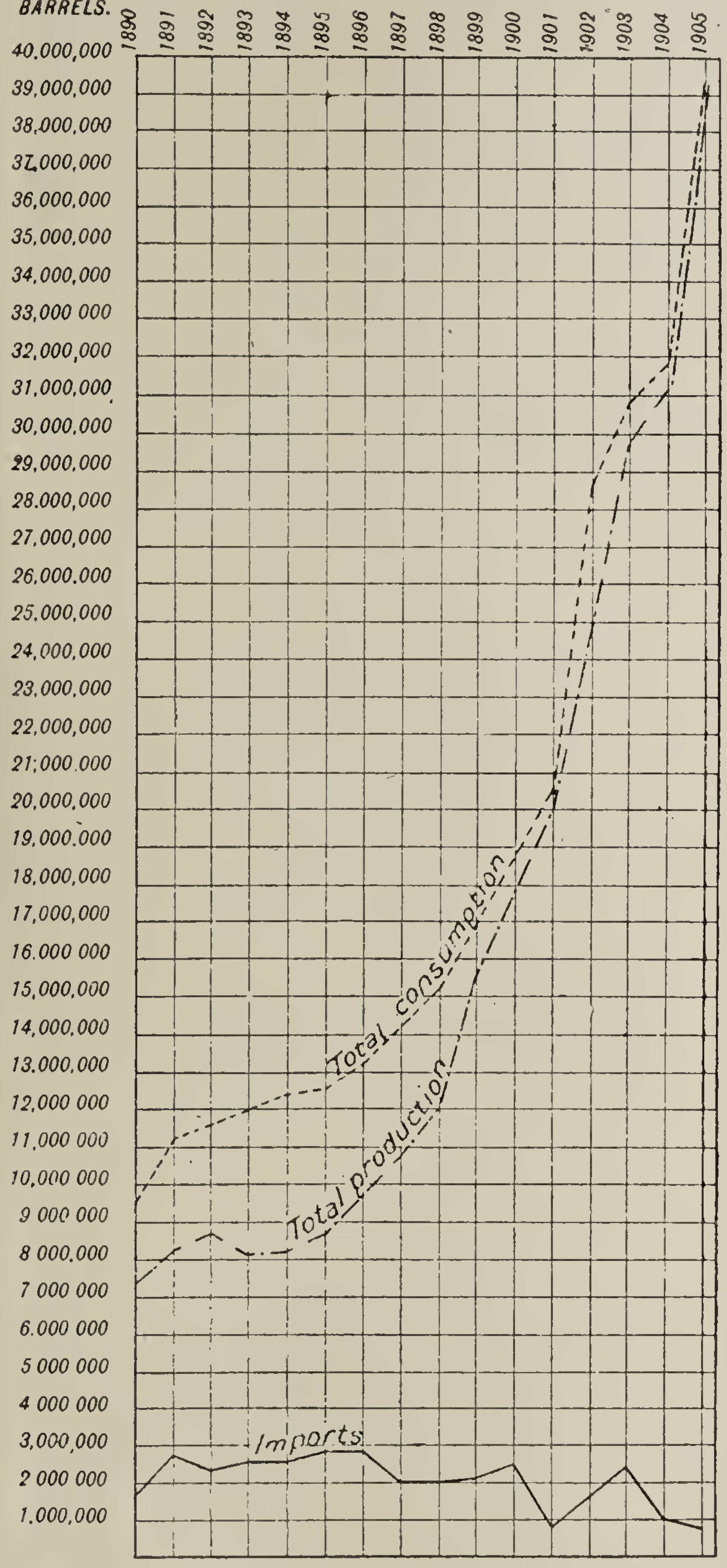

FIG. 1.—Diagram showing growth of the production and of the apparent consumption of hydraulic cement in the United States, and decline of the imports of foreign hydraulic cements, since 1890.

CEMENT IN FOREIGN COUNTRIES.

Canada.—An increased production of Portland cement and a decreased production of natural cement are shown in the records of Canada for 1905. The Geological Survey of Canada* reports that the production of natural-rock cement, which in 1904 had decreased to 56,814 barrels (of 350 pounds), valued at $50,247, fell off in 1905 to the comparatively small amount of 14,184 barrels, valued at $10,274. This was made by three firms in Ontario.

The production of Portland cement, however, continues to increase steadily. Thirteen companies were operating plants during 1905, with a total daily capacity of about 8,000 barrels—viz., one in Nova Scotia, 2 in Quebec, 9 in Ontario, and one in British Columbia, while another in Ontario was engaged in reconstruction work. The average price per barrel at the works in 1905 was $1.42, being only a fraction of a cent higher than the average price in 1904. The imports of Portland cement into Canada in 1905 were 718,275 barrels (of 350 pounds), valued at $912,209. The duty is 12½ cents per 100 pounds.

As there is very little cement exported from Canada, the consumption of the product in 1905 would be approximately 1,346,548 barrels of home product and 718,275 barrels of imported, or a total of 2,064,823 barrels.

The figures given, showing the total production of cement in Canada in 1905, are 1,360,731 barrels, having a value of $1,924,014. Of this amount, 1,346,547 barrels were Portland, valued at $1,913,740, and 14,184 barrels were natural, valued at $10,274. This total production is given as 2.81 per cent of the value of the entire mineral production in Canada in 1905.

The records from Manitoba show that more than half the

*Summary of the mineral production of Canada for 1905; Geol. Survey Canada, 1906.

cement consumed there in 1905 was from the United States, and that at least one importer of American cement was unable to obtain as much as he wanted during the year. An unusually large amount of building will be done in this district in 1906, and this, with the construction of the Grand Trunk Pacific Railroad and the extension of some other lines, will increase the demand for Portland cement.**

Mexico.—In the building up of an export trade for American cements Mexico should be considered, according to Consul Canada, of Veracruz.** A great deal of cement is used in Mexico, but the United States does not supply much of it. Mexico has been making extraordinary efforts to provide safe harbors, to improve her light-houses, to construct new and to improve old railroads, and to do many other things which require a great deal of cement, and it is apparent that that country offers a splendid field for American manufacturers of cement.

Belgium has a tight hold on the Mexican market, the greater part of all the cement consumed at the present time coming from that country. Germany is making strenuous efforts to get a foothold. German cement may be bought in Mexico for $4.50 per barrel of 396 pounds, equivalent to $2.25 United States currency. From this the price rises to $6.75 per barrel, according to brand ($3.38 United States). The import duty on cement is 55 cents per 100 kilograms gross weight, equivalent to 27½ cents United States per 220 pounds gross weight. There are minor expenses connected with this which will bring the cost a little higher. Freight from Antwerp or Hamburg to Veracruz per cargo lots may be quoted as from 12 to 15 shillings per 2,204 pounds, to which must be added 5 per cent on the total. The packages are similar to those in the United States. Near the City of Mexico two cement works are in operation, which have all they can do to furnish cement for contractors of paving and other public works in that city. Competition in the cement market is so strong that sales are made on a margin of 12½ cents United States currency.**

Bermuda.—Bermuda appears to be another market which might easily be made available for exports of American cements. Vice-consul Heyl, of Hamilton, Bermuda, reports** that up to 1904 British Portland cement constituted nearly all the cement imported into that colony, but that in 1905 a few hundred barrels of American cement were imported, with the result that American cement has been found equal to the best English brands and has been sold at 12 cents per barrel less than the English product. The dealers in English cement have heretofore been able to secure cheaper freight rates, owing to the competition of the steamship lines, but as one of these has withdrawn, the freight rate has advanced from 10s. to 22s. ($2.44 to $5.25) per ton. This new British evidence as to the quality of American cement should have the effect of breaking down the prejudice which exists in favor of British cements—in far-off British possessions especially—for its supposed superior quality.

France.—The conditions existing in France, as a possible market for American cement, appear to be rather discouraging.

Consul-General Skinner,* of Marseille, replying to a request for "as complete information as possible regarding the cement industry and markets for cement in various countries," suggests that any contemplated effort to obtain a foothold for American cement in France had better be devoted at the present time to an effort to sell cement in those remote markets to which large quantities of French cement are now being exported. The French exports of cement during 1905 amounted to 277,530 tons.

Although France imported 20,450 tons of cement in 1905, these figures offer little encouragement to American exporters, since the importations consisted almost exclusively of Belgian cement, produced near the French frontier and shipped in bulk at a minimum of expense. There is, moreover, a discriminating duty of 25 centimes ($0.048) per 100 kilos (220 pounds) against American cement, which would be obliged to pay the maximum rate of duty. This maximum tariff is 75 centimes (14.47 cents) per 220 pounds for slow-setting cement and 50 centimes (9.65 cents) per 220 pounds for rapid-setting cement.

French cement is shipped to domestic purchasers and even to foreign buyers who are able to secure prompt deliveries in jute bags. In the case of domestic transactions the cost of the package is not included, and the bags, which are worth about 19 cents each, are returned to the manufacturers. Cement for exportation is almost invariably forwarded in cheap barrels, and the prices quoted to buyers include the cost thereof. The cost of French cement of the best grade approximates $6.95 per 2,200 pounds at the factory. For the export trade competition is keen and prices vary somewhat.

The world's production of Portland cement in 1904 is thus reported by the Marseille Chamber of Commerce: United States, 3,000,000 tons; Germany, 2,500,000 tons; England, 1,500,000 tons; Belgium, 685,000 tons; France, 555,000 tons; Russia, 500,000 tons; miscellaneous, 500,000 tons.

Belgium.—Consul-General Roosevelt sends from Brussels an interesting statement concerning the cement industry of Belgium, and in regard to the reported combination of Belgian, Dutch and German cement works to regulate production and prices for a term of nine years. He says: As concerns the inquiry relative to a reported combine I am informed by one of the most important of the cement dealers in Brussels that some time ago an agreement was entered into between a German syndicate and twelve Belgian cement works to the following effect: The German syndicate agreed not to sell its cement in Belgium, and the twelve Belgian cement works pledged themselves not to sell their product in Germany; and to prevent competition the German syndicate is to confine its sales in Holland to towns lying near the German frontier and reached at a less cost than could be reached by the Belgian adherents, and vice versa as concerns towns in Holland nearer to the Belgian frontier and more advantageously accessible to the Belgians.

There are 35 cement works in Belgium producing an annual output of about 1,000,000 tons. This output is pretty equally divided between consumption and the export trade. The total quantity of cement imported into Belgium during the year 1904 was 82,704,123 pounds, valued at $174,130. Over 72,000,000 pounds came from Germany and over 8,000,000 from France; the remaining quantity came from Holland, Luxemburg and other countries.

The total quantity of cement exported from Belgium during 1904 was 1,294,248,365 pounds, valued at $27,259,810. Of that quantity England took 508,000,000 pounds, the United States 146,000,000 pounds, Holland 128,000,000 pounds, Argentina 84,000,000 pounds, and Brazil 71,000,000 pounds. In less important quantities cement was sent to Canada and other countries.

The present selling price of cement, according to quality, is from 84 cents to $1.04 per barrel of 396 pounds, gross weight, cost of barrel included, freight on board Antwerp. The price of Portland cement for home consumption is from $3.66 to $3.86 at works per 1,000 kilos. Cotton sacks and paper bags are not used for cement in Belgium. Barrels and canvas sacks only are employed. The works repurchase the sacks, but not the barrels, allowing from 3 to 9 cents per sack, according to size.

American cement, says Consul-General Roosevelt, could be sold in Belgium provided it was introduced in such manner as to attract attention and win confidence by its quality and price.*

**Daily Cons. Repts. No. 2527, April 2, 1906.

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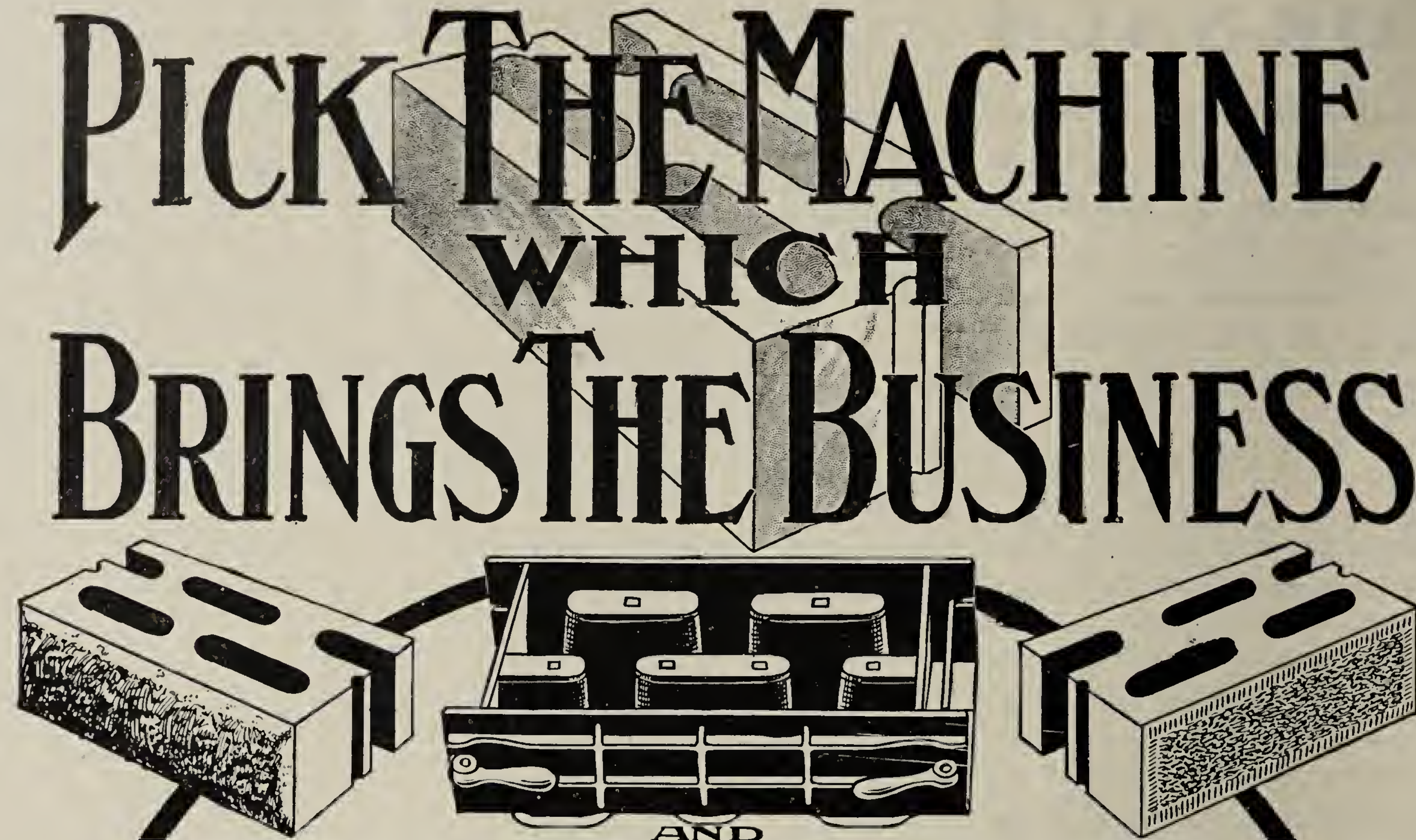

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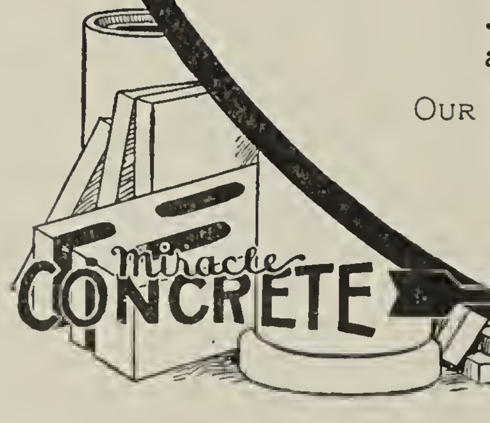

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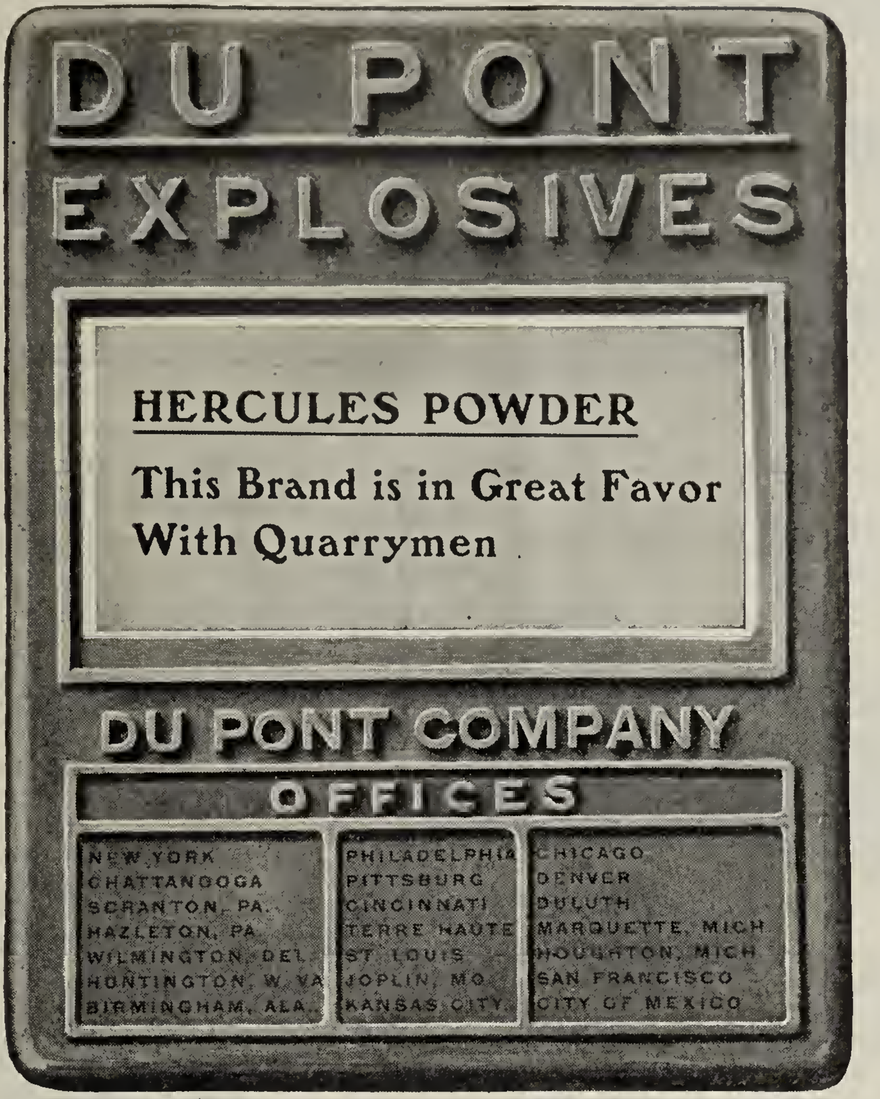

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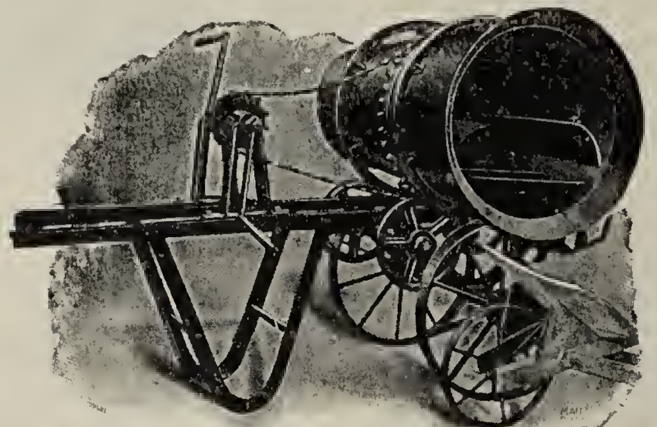

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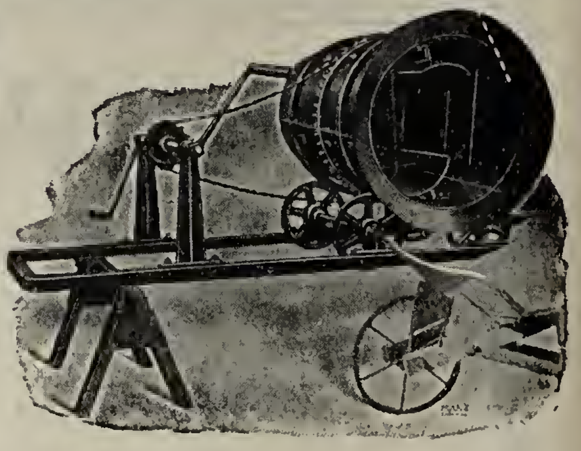

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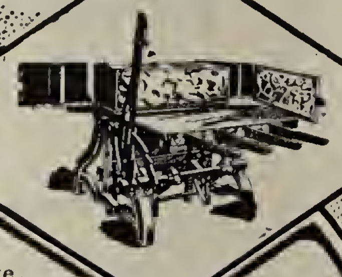

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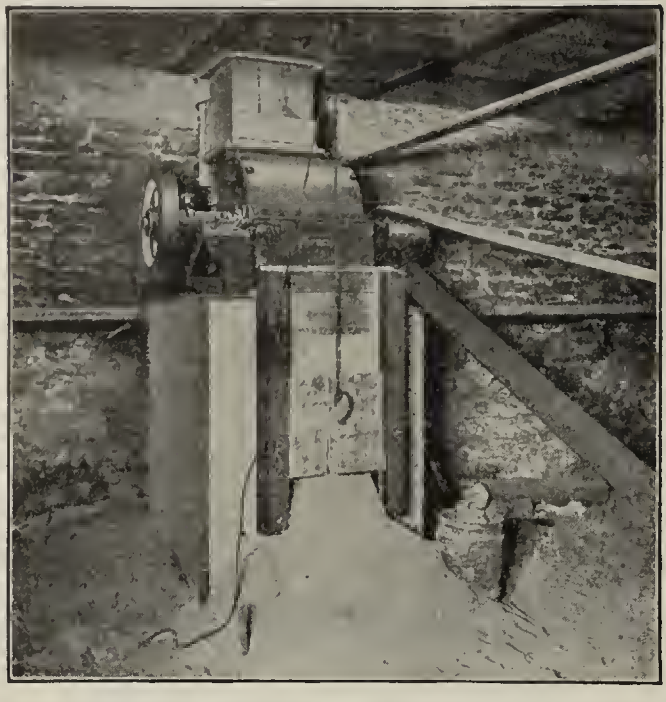

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LINK-BELT COMPANY

JULY 18, 1906

The Constitution of Hydraulic Cements

By DR. W. MICHAELIS, Sr.
Translated From the German by
DR. W. MICHAELIS, Jr.

PRICE 50 CENTS :: :: CARRIAGE FREE

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CEMENT AND ENGINEERING NEWS
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THE STOWE-FULLER CO.
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Manufacturers of
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The oldest and best **Rotary Brick** in the market. : : : : : : : : : : :

Brick made **Especially** for this purpose with high **Aluminous Clay** and burnt at a higher temperature especially made to carry a **Heavy Scale** in **Rotary Kilns**. : : : : : : : : :

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There is really only one perfect Concrete Block Machine and that's the Hercules.

An Irish Contractor
IN IRELAND

Bought a Hercules early in 1905. Later he bought two more and a few months ago he ordered four more.

What does this prove? It proves that the Hercules delivers the goods—that it makes absolutely perfect blocks. You can only fool an Irishman once and if the first Hercules was not satisfactory the other orders would not have followed.

Why did the contractor who is building the immense power station for the N. Y. N. H. & H. Railroad at Cos Cob, Conn., order Hercules Machines to do the work with?

Because after a thorough study of every other Concrete Block Machine he convinced himself that the machine that would make the most perfect blocks and make them the most economically was the

Hercules
Concrete Block Machine

If you are going to buy a Concrete Block Machine and you want the very best to be had you've got to buy the simple Hercules, the machine that makes two blocks at one time—the machine that an unskilled laborer can easily operate.

The Hercules can produce more blocks, a larger variety of blocks and better blocks in one day than any other machine, and produce them for less money.

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Century Cement Machine Co.
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ROCHESTER, N. Y.

AS OLD AS The PYRAMIDS

CONCRETE IS NOT NEW

The concrete construction of the ancients has outlived all other building materials, and after hundreds of years remains better than when built.

PHYSICS, CHEMISTRY AND MECHANICS

Combine to give to Modern Man a Superior Material.

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The "Ideal" Concrete building block machine is made in the simplest form known to mechanics. Its movements are simple, direct and positive, no waste energy. Its parts are all machine made and fashioned of the best material obtainable. Its operation and methods of making blocks are approved by the best authorities, There are more "Ideal" machines sold than any other machine made. Catalog "L" will prove it.

The Ideal Concrete Machinery Co., Station 6 South Bend, Indiana

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Works, ALPHA, N. J

Quality unexcelled. The Recognized Standard American Brand. Always Uniform.
ALPHA PORTLAND CEMENT CO.
Manufacturers of but one grade—strictly straight Portland.
General Office, EASTON, PA.

Hollow Concrete Block Building Construction
By Spencer B. Newberry

Illustrated. Covers in detail. Materials, cement and aggregates. Process of manufacture to obtain the best results. Waterproofing mixtures. Classification of machines. Hand and machine tamping. Crushing strength. Handling and storing. Table of mixtures. Strength with sand and gravel, or limestone screenings. Cost of materials. Fine sand mixtures. Absorption, porosity and permeability. Color mixtures. Estimates, labor and materials. Comparative cost of brick and concrete blocks laid up in walls. Reprohuction of concrete in various patterns, shapes and designs.

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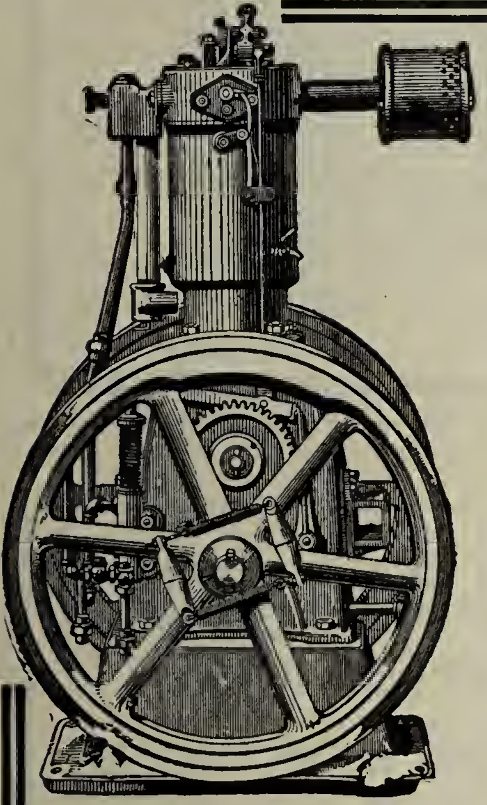

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THE I. H. C. GAS AND GASOLINE ENGINE

It will give you all the power you want, as long as you want it, at any time or place that you want it.

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It develops full rated horse power under the heaviest load, is absolutely safe and doesn't use a single charge more of fuel than the load requires.

Use gasoline, gas or denatured alcohol for fuel.

Made in the following styles and sizes:—Horizontal engines; Stationary, 4, 6, 8, 10, 12 and 15 H. P. Portable, 6, 8, 10, 12 and 15 H. P. Vertical, 2, 3 and 5 H. P.

Send for catalogue before installing any other power.

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No. 7-HH Monroe Street (Incorporated) CHICAGO, ILLINOIS

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SEVERAL attractive opportunities for lime kilns are open on the

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where all conditions are favorable for manufacture and distribution of the product.

Information concerning these openings will be furnished on application by

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A. T. & S. F. Rwy. System,
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The regular courses in Mining Engineering and Metallurgy include a thorough training in Mathematics, Chemistry and Physics, as well as Surveying, Mineralogy, Lithology, Geology, Mining Engineering, Metallurgy, Steam Engineering, Hydraulics and Electric Testing with Laboratory Practice in Ore Dressing, Milling and Smelting, and with Summer Schools of Metallurgy and Mining. For catalogues address DR. HARRY W. TYLER, Secretary.

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We are taking orders for Tampico Fibre Brushes used in making the brush finished concrete. This finish resembles the finest cut stone work. Brushes delivered by mail at $1.00 each. Address CEMENT AND ENGINEERING NEWS, 22 Fifth Avenue, Chicago.

Abundance of High Grade Materials!

Low Cost of Fuel!

PROXIMITY TO BEST MARKETS!

Are all essentials to bear in mind in determining on the location of Portland Cement Works. These essentials can all be had at several points on the line of the Atchison, Topeka & Santa Fe Railway System.

For further information address:

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INDUSTRIAL COMMISSIONER
Atchison, Topeka & Santa Fe Ry. System

DENSITOR For Waterproofing Concrete **FILLS THE VOIDS**

Mixed with concrete it produces a sound, hard, dense waterproof material that will reject water like glass or marble.

Densitor can be applied with a brush to finished concrete work, producing a sound, dense, waterproof face.

Densitor absolutely prevents efflorescence by sealing every pore in exposed faces.

Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

By the use of Densitor and proper coloring matter, the most beautiful stone can be imitated without showing the slightest trace of being artificial.

For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

Densitor can be furnished in various colors and tints (made to order only).

Densitor mixed with Portland Cement, laid onto finished concrete block, one-sixteenth of an inch thick, produces a perfect water rejecting face.

One pound of Densitor mixed with from 4 to 5 pounds of Portland Cement will produce a Hydraulic Paint that will cover from 50 to 100 square feet of surface, depending upon the density of the concrete.

Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

Densitor is being specified for one 115 suite apartment house and for one 40 suite apartment house to produce an artificial Jasper stone rubbed and polished.

Densitor is the only compound that removes the artificial appearance in Portland Cement Concrete.

Our factory is now over-crowded with orders; future orders booked.

THE DENSITOR COMPANY,

228 La Salle St., CHICAGO, ILL.

10 Pound Samples F. O. B. Chicago, $1.00. Terms strictly cash.

Hon. C. C. Brown's Residence, Springfield, Ill.

THE ORIGINAL INVENTOR'S LATEST PRODUCTION IN HOLLOW CONCRETE BUILDING BLOCK MACHINES ADVANCING THE INDUSTRY ONE HUNDRED PER CENT.

Harmon S. Palmer's Self Closing Adjustable-Automatic

The crystallization of every merit in the industry TO DATE.

Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

For the purpose of advertising these machines they will be sold for a limited time at $295.00 delivered F. O. B. cars one of our nearest factories, either with or without territory.

WANTED — WANTED — WANTED

GOOD AGENTS, LIVE FACTORIES AND LOCAL LAWYERS.

We agree to prosecute infringers. Many already enjoined. Many suits pending.

The Harmon S. Palmer Hollow Concrete Building Block Co.

Write for Catalogue D. Washington, D. C.

Cement and Concrete

By LOUIS CARLTON SABIN, B. S. C. E.,

Assistant Engineer Eng. Dept. U. S. Army, Member American Society Civil Engineers

An up-to-date thoroughly practical treatise on the use of concrete, covering all branches of construction

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For Cement Kilns

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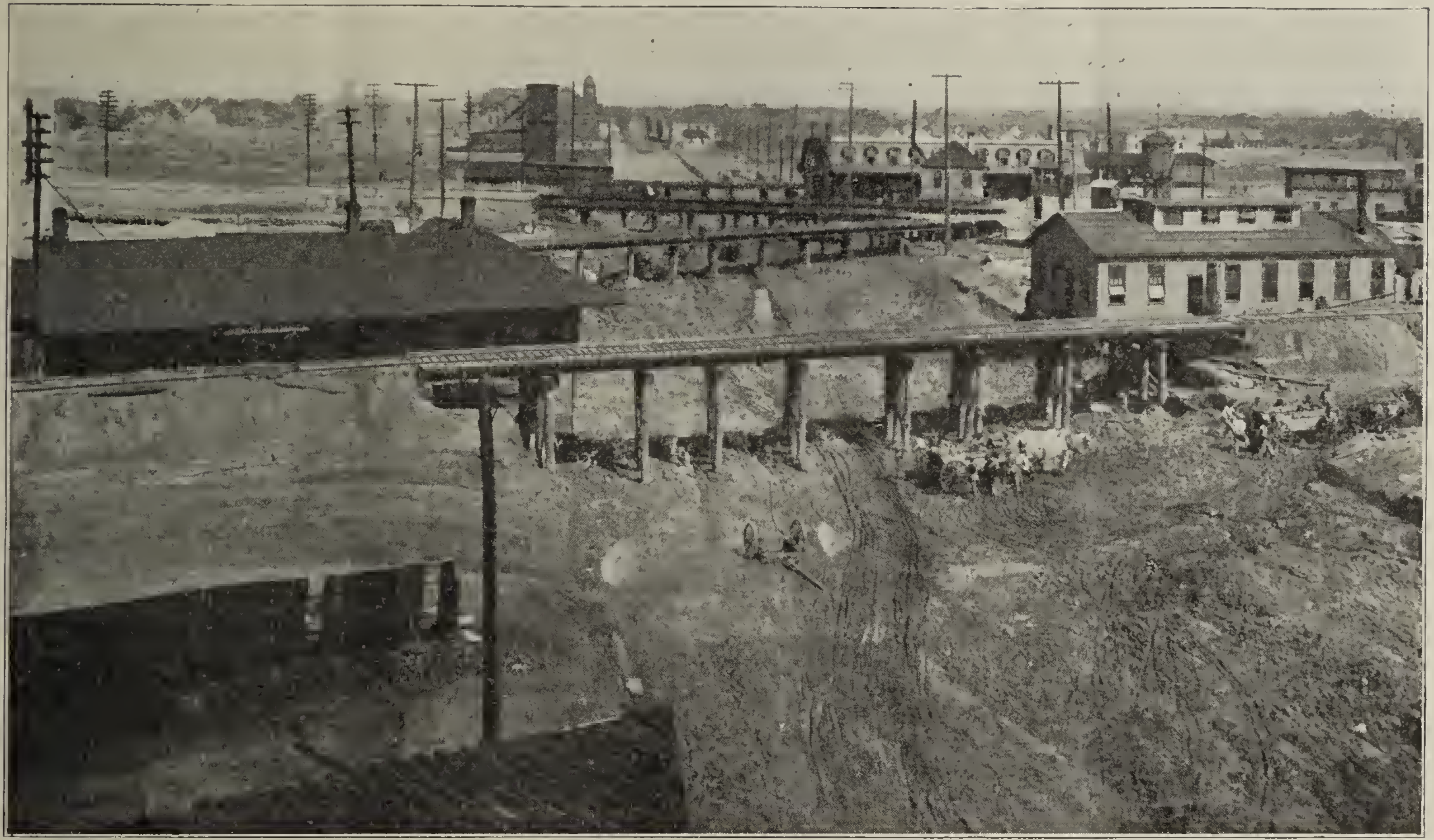
ENGINEERING NEWS



Working on the approaches to the Michigan Central Ry. tunnel under the Detroit river, the Michigan Central Ry. tracks are being depressed, while the Grand Trunk, Wabash and Lake Shore Ry.'s Tracks are being raised, this work is known as "grade separation" in railway construction parlance.

CEMENT AND ENGINEERING NEWS

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"This world belongs to the energetic"

This Paper is a Member of the Chicago Trade Press Ass'n

CHICAGO, OCTOBER, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

BRICKLAYERS AND CONCRETE CONSTRUCTION.

Concrete construction is just now a live subject with the bricklayers' unions of New York city. There people lay awake nights to devise ways and means to oppose concrete construction. Finding that all their previous efforts to cry down concrete have resulted in failure, they have finally taken the bull by the horns for the final hustle and tussle to down concrete by dictating to all the contractors in New York city using brick in building construction, and demanding that such contractors shall not employ any labor in concrete work at less than union bricklayers' wages, and under the direct supervision and control of the bricklayers' unions. This means that the laborer who shovels, mixes and wheels concrete in a barrow shall receive 70 cents per hour or $5.60 for eight hours work. This will increase the cost of concrete work materially should the contractors submit to the bricklayers' union demand. It would be a bad day for concrete construction to have to pass under the supervision and control of the bricklaying fraternity. In large cities where these unions exist in force, bad concrete work would result in order to check its growth. Bricklaying would soon become one of the lost arts if bricklayers had their way, as American born young men have little opportunity to learn the trade on account of the restrictions imposed on the number of apprentices allowed under union rules. Consequently the unions are constantly taking in skilled bricklayers fresh from Europe. These people do not possess the average common school education which the American lad receives; and in as much as ignorance and force usually go hand in hand, this is the trouble with our trade unions as a rule; they appeal to force rather than to reason in dealing with employers in order to maintain a monopoly for their craft. This will continue until a fair average education is diffused through the various labor unions, and this will only be accomplished when our American boys are free to learn any trade they may choose without interference from the existing arbitrary unions of to-day.

DETERIORATION OF RUBBER IN SUNLIGHT.

In a recent number of the "Gummi Zeitung," Dr. Ditmar describes a method of testing the comparative liability of rubber samples to sun cracking. It is not practicable to expose the samples to sunlight for any length of time, as in the first place it is inconvenient to wait so long for the results of the tests in addition to which they are at the mercy of the weather. Weber has described a method by which the action of air and sunlight can be imitated in the laboratory. He exposed weighed pieces of rubber of equal area to the action of a solution of acetone peroxide for a period of two days, the increase in weight represents the liability to sun cracking. He states that he found the results obtained by this method to agree well will the effects produced by exposure to sunlight. I cannot remember having come across detailed figures or results described in full. Two days' action has not much visible effect on the surface of samples which I tried, but if the action be prolonged the rubber presents a blistered appearance. Ditmar replaces acetone peroxide by gaseous oxygen under pressure, at the same time the sample is heated to 100 degrees C. His procedure is as follows: About half a gram of the rubber under examination is placed in a strong glass tube sealed at one end, the other being drawn out a little. A current of oxygen is then led into the tube through a narrower one, and when the air is completely displaced, the tube is sealed up. It is then heated for five to twenty hours in a tube (cavius) furnace at 100 degrees C., and after cooling, is opened, and the rubber taken out and weighed. The increase in weight due to absorption of oxygen is a measure of the liability to sun cracking. Of course, the test is only comparative. In some cases, curiously enough, there is a considerable decrease instead of an increase in weight, possibly due to the oxidation of the sulphur to dioxide, which being a gaseous substance, is lost. In such cases Ditmar regards the loss in weight as a measure of the permanence of the rubber article under examination, but it is difficult to understand how such consideration can be applied in practice. How would he compare two rubbers, one of which gained a little and the other lost a little during the oxygen treatment? Some samples he examined lost as much as 37 degrees by weight, and it is difficult to see how this is to be accounted for on the above explanation. It is only uncombined sulphur which is oxidized, and hence the conclusion must be drawn that the samples in question contained at least this proportion of sulphur.

On the other hand, some samples showed as great an increase in weight, which is also an astonishing result. The absorption is influenced by the porosity, which has probably little to do with the permanency of the sample, an evident drawback to the process.

Dr. Ditmar recommends the use of tests for tensile strength, in conjunction with his oxidation process. The tensile strength is measured before and after oxidation, and conclusions may be drawn as to the deterioration of the sample when exposed to oxidizing influences. Eventually Ditmar has somewhat modified the mode of carrying out his oxidation test, with a view to rendering it more applicable in general practice. The glass tube is replaced by a strong U tube, fitted with glass stop-cocks. A current of dry oxygen is passed through until the air is swept out, when the further cock is closed, so that the rubber is exposed to the pressure of the oxygen gas in the gasometer. The U tube is immersed in boiling water and, in this way the rubber is exposed to the necessary temperature under a small, although constant, pressure. The modification he has found to answer well. In all probability the conditions of the experiments are more constant when working in this manner, as the pressure will not vary with the amount of oxygen absorbed.

CEMENT SHIPMENT TO ALASKA AND OTHER UNITED STATES POSSESSIONS.

During the past eight months, ending Aug. 31, 1906, we shipped from this country to our dependencies the following quantities of cement:

To Alaska, 1,818 barrels, valued at $5,513. To the Havana Islands, 5,226 barrels, valued at $12,397. To Porto Rico, 53,933 barrels, valued at $77,293. To the Philippine Islands, 70 barrels, valued at $88.

Birmingham, Ala., has the largest cotton warehouse in Alabama constructed of reinforced concrete, with the lowest insurance rate. The main warehouse is 378 by 124 feet, divided into 12 compartments, each having a capacity for 1,000 bales of cotton. The storage has been reduced to one-half the former rate.

PAVED FEEDING LOTS FOR CATTLE.

The Agricultural Experimental Station of the University of Illinois has been conducting experiments on the feeding of cattle in carload lots on paved or unpaved areas. The results show that cattle fed on lots paved with either brick or concrete increase in weight and are in much better condition for the market on the same quantity of feed than the cattle fed on unpaved lots or feeding grounds. The cattle fed on paved areas took on fully one hundred pounds more weight and sold from 15 to 25 cents per hundred more than cattle on the unpaved area. Illinois farmers breeding cattle for the market are taking advantage of these experiments and are constructing concrete pavements on the lines laid down by the University of Illinois Agricultural Station. In fact large quantities of cement are now being consumed by farmers throughout Illinois for this work. The farmers' institutes have taken the matter up, and are urging their members to adopt this method of cattle feeding on paved feeding lots. The average cost of brick paved feeding yards without sand foundation or wooden curbing around the areas is 80 cents per square yard. The oak curbing 2 in. by 8 in. by 16 ft. around a lot 36 ft, by 36 ft., will bring the cost of brick pavement to 10 cents per square foot with the sand and gravel foundation from 13 cents to 17 cents per sq. foot. Cement pavements can be laid cheaper, and will require no curbing, and will not require constant resetting, all of which the farmers are beginning to realize. These improvements are in line with scientific farming.

CANADIAN CEMENT WORKS SOLD.

Negotiations were closed Oct. 5th by which New York capitalists have secured control of the large Crescent Cement works, operated by Mr. Thomas Morgan at Longue Point. Province of Quebec, Canada.

It is the purpose of the new people to erect a large mill on the present property with an initial capacity of about 2,000 barrels a day and work will be proceeded with at once.

The property covers about 180 acres and has been a prominent concern in one of Canada's growing industries.

The Washington Portland Cement Co. has removed its general office from Seattle to Anderson. Skagit county, Washington, and has inincreased its capital from $200.000 to $400.000.

Yipsilanti, Mich.. has laid about 150.000 sq. ft. of cement walk in the first ward during the present season.

THE MARQUETTE CEMENT CO.'S NEW POWER PLANT.

The New Power Plant of the Marquette Cement Company was started up for the first time on Oct 16th.

Souvenirs of the occasion, consisting of cigars wrapped in new dollar bills, were distributed to each of the company's 250 employes, who by their efforts and interest, have done much toward the success of this wonderfully successful company.

THE NEW ADDITION.

The new building is 125 feet square, built of steel and concrete from ground to roof, installed with 3,000 horse power compound condensing engines, stirling water tube boilers, electric generators, heaters, purifiers, etc. Coal is delivered to the boilers by chutes from the Illinois Central railroad hoppers above, and the ashes are dropped direct from the automatic stokers to cars on the C., B. & Q. R. R. tracks. The new power station will deliver the electric current to the cement plant, which will now be run entirely by electric power.

WILL SPEND HALF A MILLION.

The new power plant cost something over $200,000, and is pronounced by experts the most complete and economical in operation of any plant in the west.

The enterprising company has just commenced operations to double its present output of cement by the addition of a large number of furnaces, grinding machinery, etc., contracts for this work amounting to $250,000, having all been let, and work to be completed by March 1st, 1907.

WATERPROOFING REINFORCED CONCRETE ROOFS.

The roof of the animal building at the Cincinnati Zoo constructed in reinforced concrete began to show leaks. The trustees first proposed covering the roof with copper sheeting, and finally decided to use cement mortar containing Medusa water-proof compound which was applied as a coating directly on the reinforced concrete roof which resulted in producing a thoroughly watertight job. A patent has been granted to the Sanduskey Portland Cement Co. on the Medusa waterproof compound under the date of Oct. 24, 1906.

ART CONCRETE WORK.

We note with pleasure that Mr. Hans Hirsch, the well-known sculptor has entered the field with new and artistic patterns for molding high-grade concrete work, and as the general manager of the Orleans Tile Mfg. Co. of New Orleans, La. Mr. Hirsch has had over 30 years' experience in producing ornamental concrete work in this country and in Europe. His work in fine art concrete, has been seen and admired by millions of people, having been selected by the German government to design the cement statuary at the World's Fair at Chicago, 1893. Mr. Hirsch has received sittings from President McKinley, Grover Cleveland, Mr. Harrison, and other notables of this country. The high grade art stores throughout the United States were supplied with sculptures from Mr. Hirsch's studio. Specimens of his work are to-day found in thousands of artistic homes. We are, therefore, glad to announce that Mr. Hirsch has placed upon the market an artistic and practical set of molds for casting tombstones in concrete. These molds produce beautiful and correct designs which will create a good demand for this class of work in every town and village in the land. One man operates these molds and the set will constitute a factory outfit. These tombstone forms can be worked during the winter season when outside work has closed. We believe these forms will fill a void that will be appreciated by concrete workers generally, as a new line of manufacture which will prove a new source of revenue during the slack season. Address Orleans Tile Mfg. Co. for additional particulars.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	AUGUST				EIGHT MONTHS ENDING AUGUST			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	....	......	35,714,296	$101,685	6,894,800	$ 21,760	67,411,896	$ 193,371
Belgium...........	8,559,033	$23,238	48,889,182	202,529	75,250,548	232,807	112,910,244	400,329
France.............	297,600	1,019	892,800	3,057	4.323,900	15,321	10,985,806	36,487
Germany	13,852,711	53,018	28,597,660	96,810	96,832,084	324,863	141,888,245	479,388
All Other Europe.	....	......	280.000	802	240,659	609	288,332	824
British North Am.	....	......	225,400	1,624	127,660	1,368	2,445,320	16,918
Other Countries..	22,240	168	11,887,202	58,980	469,300	1,781	53,274,816	243,589
TOTAL...........	22,731,584	$77,443	126,486,540	465,487	184,138,951	$598,509	389.214,659	$1,370,906
Domestic Exports of Cement, bbls.	125,116	$160,757	69,210	$124,663	714,585	$953,512	397,695	$631,258

There were 6,967,588 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Aug. 1905, valued at $21,441, against 7,246,416 lbs. in Aug. 1906, valued at $21,383.

For 8 months ending in Aug. 1905, there were 68,450 tons of asphalten imported in the United States, valued at $289,410 against 64,413, tons imported in 8 months ending Aug. 1906, valued at $266,718.

STONEKOTE—AN OUTSIDE FINISH FOR BUILDINGS.

Portland cement makes the ideal outside coating for buildings, being as hard and indestructible as natural stone, and when used in a plastic state allows the architect to carry out his elaborate designs. The soft gray of the natural color when cement is used with a pure white sand gives the most pleasing effect, while it is perfectly practical to furnish casting material for caps and bases, float finish and rough cast surface all to match in shade of color in any of the following: Light Gray, Dark Slate, Rose Pink, Dark Red, Rich Cream, Decided Buff, Light Brown, or Dark Brown. Old houses can be made new without paint, any practical contractor can do the work. "Stonekote" Portland Exterior is a "ready-to-use" compound of Portland cement and pure white sand. It differs from all other materials used for out-door work, in that it does not contain lime or stucco. It has all the durability of cement sidewalk surface and will stand all the laboratory tests given to Portland cement, including the boiling test. A briquette made of this material, one day in the air six days in water followed by seven days' drying will stand a tensile strain of from four to five hundred pounds. A Rough Cast coat is the same as above with large white quartz added to give it the rough surface as shown in Fig. 2.

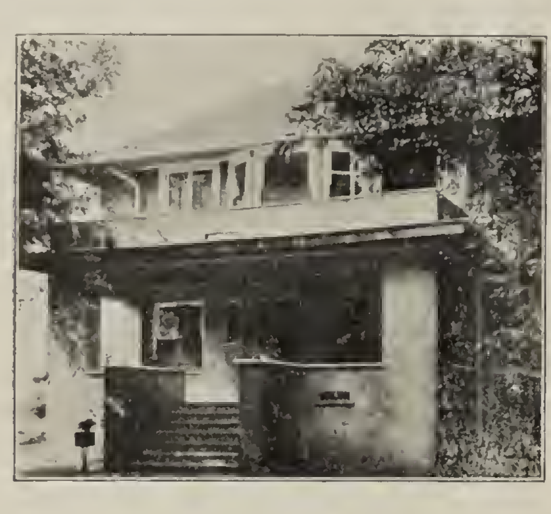


Fig. 1. Stonekote Cottage.

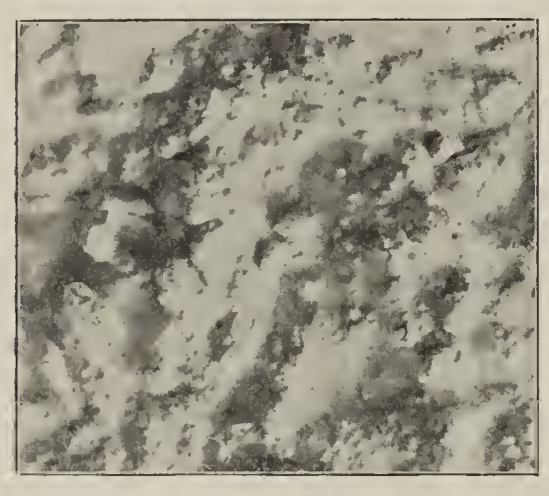


Fig. 2. Stonekote Finish. Natural Size.

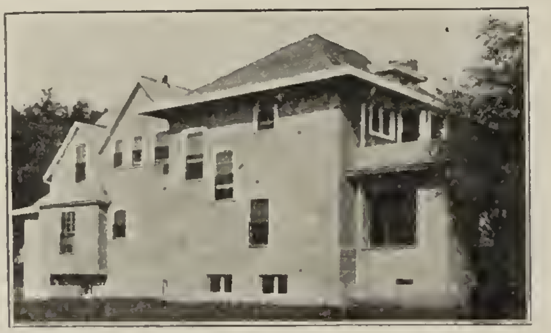


Fig. 3. Stonekote Dwelling.

"Stonekote" Portland Exterior is made in three grades .... the different parts of the work. Metal Scratch Coat is heavily fibered with long double picked goat hair. Is packed 100 pounds in each bag. One bag should do two and one half yards of scratch coat on metal lath. Second coat is without fiber, it spreads readily, holds in the box at least one and one-half hours. Can be floated to a true light gray surface for plain or panel work. One sack of 100 pounds should do two and one-half yards of second coating.

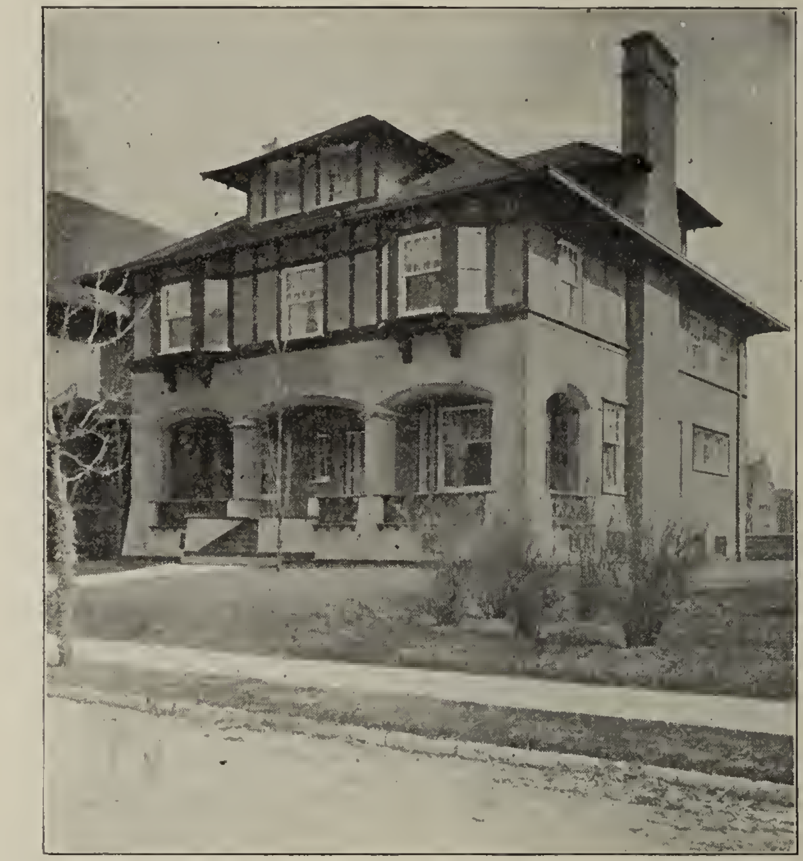


Fig. 4. Stonekote Residence.

Rough Cast Coat should be mixed as used in the box from which it is to be thrown, adding water only. One ton will do from one to two hundred yards of surface, according to the degree of roughness desired.

Colored work is not advocated for sand float surfaces owing to the difficulty of producing perfect float work. This material is coming into extensive use in the vicinity of Chicago for covering residences and churches. Our illustrations show several fine specimens. Fig. 1, as a handsome cottage. Fig. 2 shows the actual size of rough cast finish. Fig. 3 is a residence; the rear portion was an old frame cottage with a new portion added in front, both being covered with stonekote. Fig. 4 is a handsome dwelling at 37 Gordon Terrace on the lake front, Chicago. It is sold by the bag or ton, either plain or colored by the Garden City Sand Co. of Chicago, who can be addressed for prices and additional particulars.

INJURIOUS EFFECT OF WHITE LEAD

A committee appointed by the French Senate to inquire into the injuries to painters from the use of white lead has just made its report to the effect that 88 departments of France were investigated. It was found that out of 194 journeymen painters who were in the hospitals of France in 1904 only 27 were sick from diseases originating from that trade. "If this number were double," says the report, "we are still very far from the ravages which have been attributed to white lead. The committee has not been able to discover any evidence of the excessive mortality which was reported to prevail in this business. The death rate among house painters is very low, averaging only one in 7,000 or 8,000 journeymen.

In Paris the journeymen painters number 20,000, and the average treated in the hospitals during the last five years was only 120. The report concludes that the mortality among the painters in France is only excessive where there is too free indulgence in alcoholic stimulants.

What is said in this report regarding French painters may easily be accepted as a fair estimate of the supposed dangers from white lead in the United States and other countries.

The Rolf Cement Co. of Alameda, Cal., employ 50 men manufacturing cement brick for the San Francisco trade. This force will be increased to meet the increased demand. Alameda is located on the bay opposite San Francisco.

DETROIT RIVER TWIN RAILWAY TUNNEL.

The contract for the construction of a twin railway tunnel between Detroit, Mich., and Windsor, Canada, has been awarded to the Butler Bros.-Hoff Co. of New York, the contract price being approximately $10,000,000. Four different sets of plans and specifications for the project were submitted to an advisory board of engineers, consisting of W. J. Wilgus, Howard A. Carson and A. S. Kinnear.

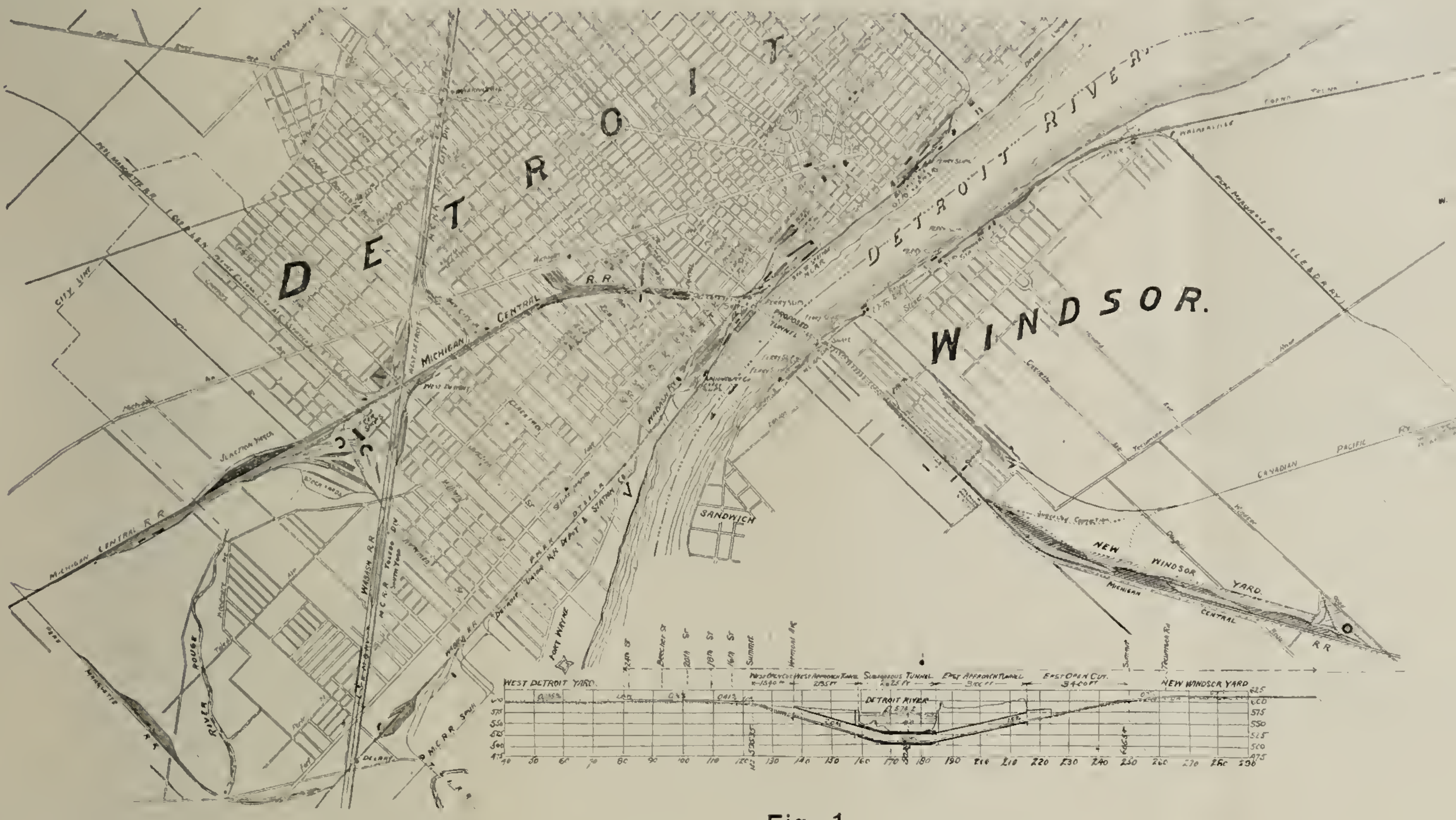


Fig. 1.
Detroit River Tunnel—Map Showing Approaches and Profile.

Fig. 2.
Grade Separation, Michigan Central Ry., West Detroit, May, 1906.

Fig. 3.
Grade Separation, Michigan Central, Ry., June, 1906.

Design A calls for a trench excavated in the river, and refilling the excavation with concrete with two steel tubes imbedded therein, as shown in the illustration. After the dredging is completed, piles will be driven into the trench and cut off at the required height. Two feet of gravel filling will rest on the clay bottom. Steel beams will be mounted on the head of piles. These beams will form saddles upon which the steel tubes will be carried during the depositing of the concrete envelope. These tubes will be reinforced on the outside with 30 inches of concrete and will be built on land and floated on scows in sections about 267 feet long and lowered carefully in place, section after section, and connected by sleeves at the end of each tube, one sleeve being slipped over the other, and bolted together by flanges on the sleeves with a rubber gasket inserted between the flanges. There is an annular chamber 3 by 18 inches around the tubes at the joint with two small openings fitted with two small flexible pipes. A rich cement mortar will be pumped under pressure through one pipe until it comes out through the other, thus completely filling and sealing the joint. After which concrete will be deposited by the Tremie bucket, under the supervision of divers who will see that the bucket deposits its load directly upon the mass of concrete already in place to prevent the cement from being floated away which would be the case should the concrete fall through the water. The concrete mass will be 25 ft. deep, 45 ft. base and extreme width 69 ft., as shown by the cross section illustration. There will be 41 ft. of water over the concrete in the river channel. The river section will be 2,625 ft. long, the eastern tunnel approach, 3,100 ft., the western tunnel approach 2,135 ft.

Design B calls for the construction of the inner tubes on land to be floated and sunk in place and connected together, and made water tight, the trench being dug as in design A, and a 2 ft. layer of concrete deposited therein, upon which saddle will be placed to receive the tubes which will be filled in above and below with concrete, and finished as in plan "A."

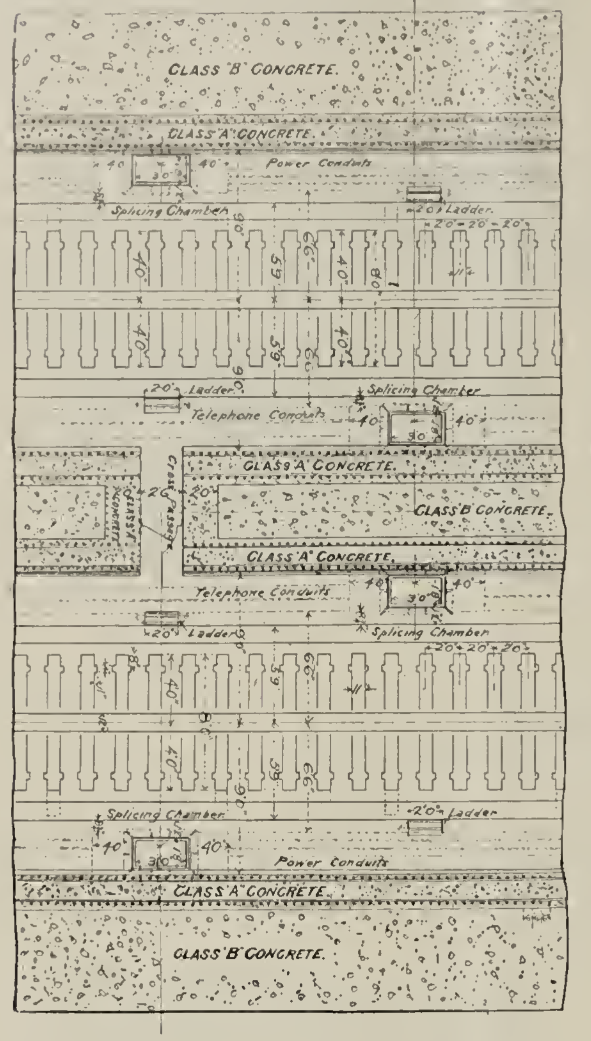


Fig. 5.
Plan of Double Tunnel—Detroit, River.

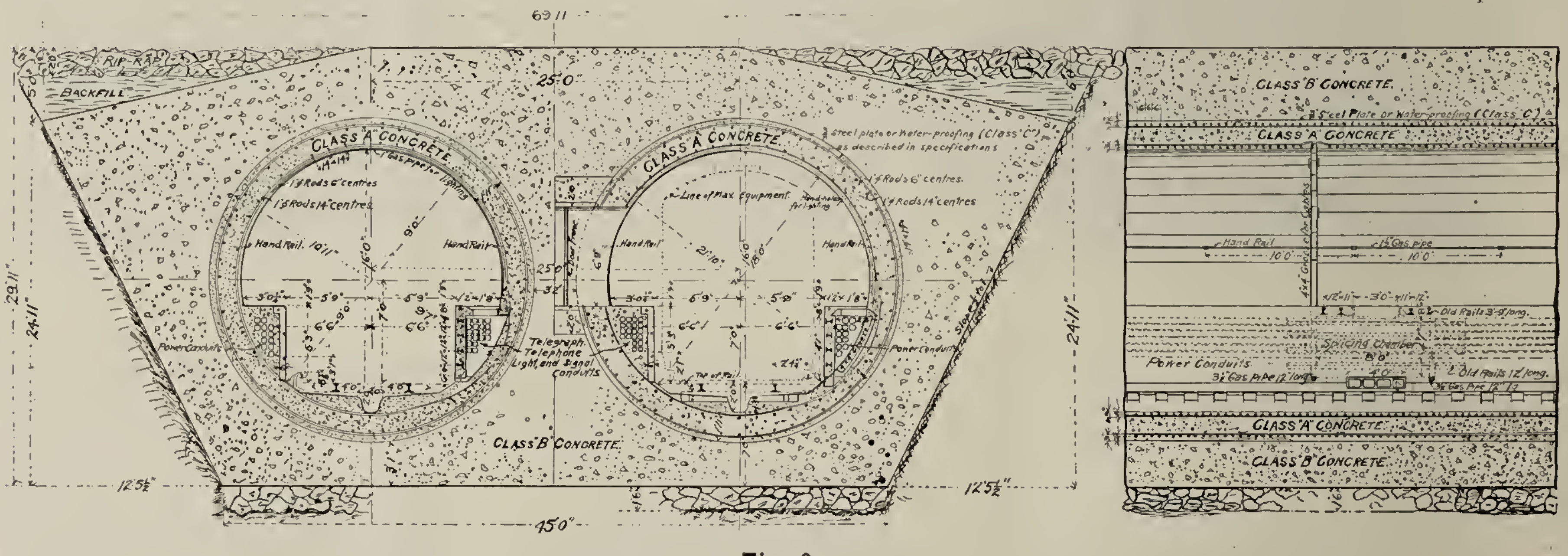


Fig. 6.
Concrete Work on the Detroit River Tunnel.

Design C is much similar to design "A," except that the steel tubes will be strengthened by 10 inch one steel I beams.

Design D is the shield tunneling method employed on the St. Clair tunnel and the St. Clair river.

The concrete is classified under two heads, class A and B.

Class A is a mixture of 1 part Portland cement, 2 parts sand and 4 parts No. 2 crushed stone.

Class B concrete is 1 part Portland cement, 3 parts sand and 6 parts No. 1 crushed stone. Class A concrete will envelop the tube and class B for all other concrete.

Considerable work has been done on the tunnel approaches shafts have been sunk on both the American and Canadian sides, and the tracks of the Michigan Central are being lowered and the tracks of the Grand Trunk, Lake Shore and Wabash railways are being raised. This work is styled "grade separation," all of which is shown in the illustrations. The total length of the tunnel is 12,800 ft., and from portal to portal 7,860 ft. The maximum grade on the American side is 2 per cent and on the Canadian side 1.5 per cent. The work is to be completed in one year from the commencement of the river section.

COAL PRODUCTION IN 1905.

Coal production in the United States for 1905 was 392,919,341 short tons, of which 77,623,850 tons were anthracite, mined in Pennsylvania. The same state was the largest producer of bituminous coal, having mined 118,413,637 tons. Illinois is the second largest producer of soft coal, having mined 38,434,363 tons. Ohio produced 25,552,950 tons. The entire amount of coal produced in the United States from 1814 to December 31, 1905, was 5,970,773,571 short tons.

VICKSBURG.

Bids for Observation Tower in Military Park Rejected.

Vicksburg, Miss., Sept. 14.—The contract submitted to the War Department for approval by the National Military Park Commission for the building of a concrete observation tower in the Park here by William T. Young has been returned. Approval is withheld and the commission was authorized to readvertise for bids. The department gives as its reason for the rejection of its contract the fact that "it did not appear that other bidders were invited to submit bids for a concrete tower. The contract was made without competition."

The report that a company known as the Tennessee Portland Cement Co. would erect a plant at Copenhagen, Marion county, Tenn., opposite Bridgeport, Ala., is without foundation. Some eighteen months ago Iola, Kan., capitalists were induced to look over the proposed site. Nothing further was done, until the past few weeks, when new options have been taken on the same land, but the project remains indefinite.

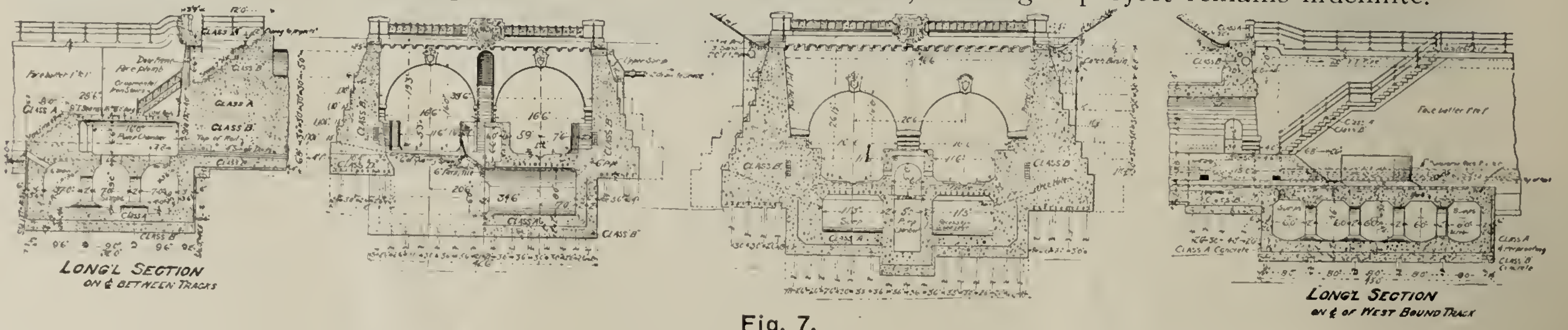


Fig. 7.
Longitudinal & Transverse Section Showing Concrete Work, Detroit River Tunnel.

THE WINTON BUILDING REINFORCED CONCRETE CONSTRUCTION.

The Winton building, erected on the northeast corner of Michigan avenue and Thirteenth street, Chicago, is 100 feet front, 130 feet deep, and is a three-story and basement reinforced concrete structure.

The basement is 10 ft. 6 in. high, the first story 15 ft. and the other two are each 12 ft. high. The building was designed with a view to adding 4 more stories at some future date, thus making a 7-story building, and with the idea of subsequent addition in view the roof was constructed like a floor, with a gravel covering, which was sloped slightly. The reinforcement throughout is smooth round rods of medium steel with an elastic limit of 36,000 lbs. per sq. in. The curtain walls are of pressed brick, the front is terra cotta, the remainder of the building being reinforced concrete throughout.

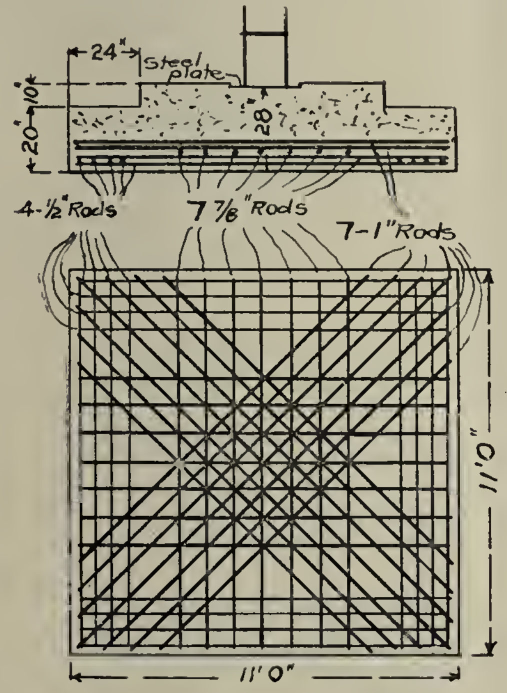


Fig. 1. Column Footings.

FOUNDATIONS.

The footings for the columns were spaced 20 ft. center to center, at the end of the building, and 15 ft. 6 in. center to center at the side of the building. These footings are 11 ft. square; this size was chosen so that the pressure on the underlying earth might not exceed 4,000 lbs. per sq. ft.

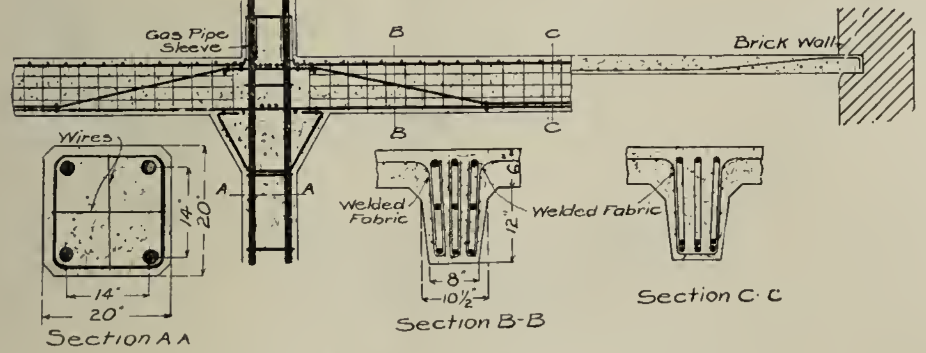


Fig. 2. Section of First Floor Girder.

A A Column Section.

B. B. and C. C. Girder Sections.

The soil under the foundations is a stratum of fine gray sand, about 15 in. thick, under which is clay. The footings were constructed in the following manner:

First, a 4-inch layer of concrete was spread in the bottom. This concrete was 1 part cement, 3 sand and 5 parts of limestone crushed to 1½ inches. Then sixteen ½-in. rods were put in as shown in Fig. 1, four of them lying parallel and close to each side of the footing. Upon these were laid two sets of 7/8-in. rods spaced 6 in. apart. These sets crossed at right angles, and were parallel to the ½-in. rods above mentioned. Lastly, the two sets of diagonal 1-in. rods, seven in each set, were placed in. After tying this combination or rods together at as many intersections as was necessary to hold then in position, a 1 :2½ :2½'-gravel-concrete was carefully put in, about 6 in. thick, so as to entirely cover the rods. Above this came 1 :3 :5 concrete, like that below the reinforcement, till the total thickness was 20 in. The size of footing was reduced from this point. A mold 7 ft. square by 10 in. deep was placed above and filled with concrete. Near the top of this mold was laid a steel plate, ½-in. thick and 2 ft. square, upon which rests the column reinforcement.

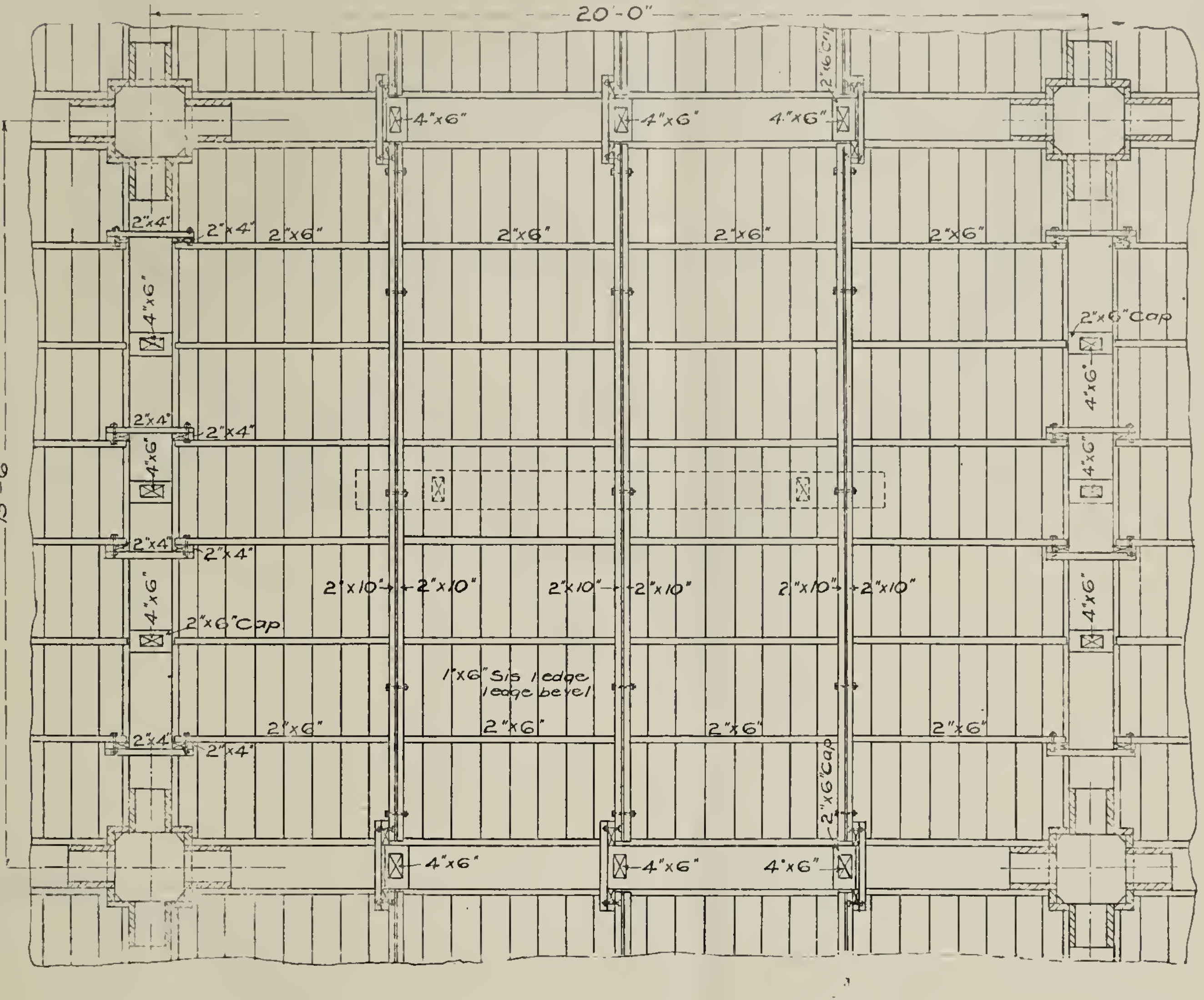


Fig. 3. Plan of Centering for one Panel.

COLUMNS.

The columns are 20 in. square, reinforced with four steel rods one near each corner, which are tied every 2 ft. vertically, with 3/8-in. square bars wrapped round the four vertical rods as shown in the column section. The centers of the opposite sides of each of these bands are wired together, to assist in preventing the rods from spreading. This can also be seen in the sectional view, Fig. 2. The column rods in the basement are 2 7/16 in. in diameter; these rods reduce in diameter from floor to floor so that in the third story they are 1⅝ in. in diameter. The joint between the column rods or adjacent stories is made 6 in. above the floor level. The joint is secured by wedging the ends of the rods into a sleeve of gas pipe, to hold them in place, as shown in Fig. 2.

GIRDERS AND FLOOR SLABS.

The girders are 18 in. deep (including the 6 in. floor) and tapering from 10½ in. wide below the floor to 8 in. wide at the lower side of girder. Their reinforcement consists of 9 rods, three 1-in. tension rods along the bottom, three 1-in. shear rods bent up about one-third of the way from each end, and three 13-16-in. compression rods near the top. This gives the reinforcement the form of 3 trusses. Each truss is wrapped round with electrically welded fabric of No. 9 steel wires, of 4 by 6-in. mesh. This fabric extends one-third of the span of the girder each way from the supports. The three trusses are tied together with the fabric along the center third of the span. The sectional view of girder shows these points. In the basement the column rods are 6 in. thick, in panels 15 ft. 6 in. by 20 ft., weighing 75 lbs. per sq. ft. The reinforcement of the main floor consists of 7/16-in. rods spaced 4 in. apart in both directions, and carried through the girder reinforcement. Additional rods are placed over the girders, extending from 3 to 5 ft. on each side. This is shown in the sectional view of the centering.

MOLDS AND CENTERING.

All molds were made of Norway pine, dressed on all sides, so as to leave as little imprint on the concrete as possible. The molds were bolted or screwed, no nails being used. This was done so that the molds could be taken apart easily and so one set of molds could be used for all the floors. After the columns in the basement had set, the molds were spliced 5 ft. so as to be used for the first story. The column molds were made of 1¾-in. material. The sides were cleated together by means of 2 x 6-in. pieces screwed on. The four sides were clamped together every 2 ft. 6 in. vertically. The floor molds were in the form of boxes, 4 ft. 7 in. by 15 ft., the outer ends and sides forming the sides of the girder molds. The bottoms of the girder molds were supported every 5 ft. on 4 x 6-in. posts, which were diagonally braced, and rested upon double wedges, which by proper adjustment, secured correct alignment of the under side of the girder molds. See Figs. 3 and 4. Should the molds sag, the reinforcement might be displaced in the girder, thus defeating the purpose of the design. From this it is seen that the preparing and handling of molds and centering is as important as the design of the reinforced concrete itself.

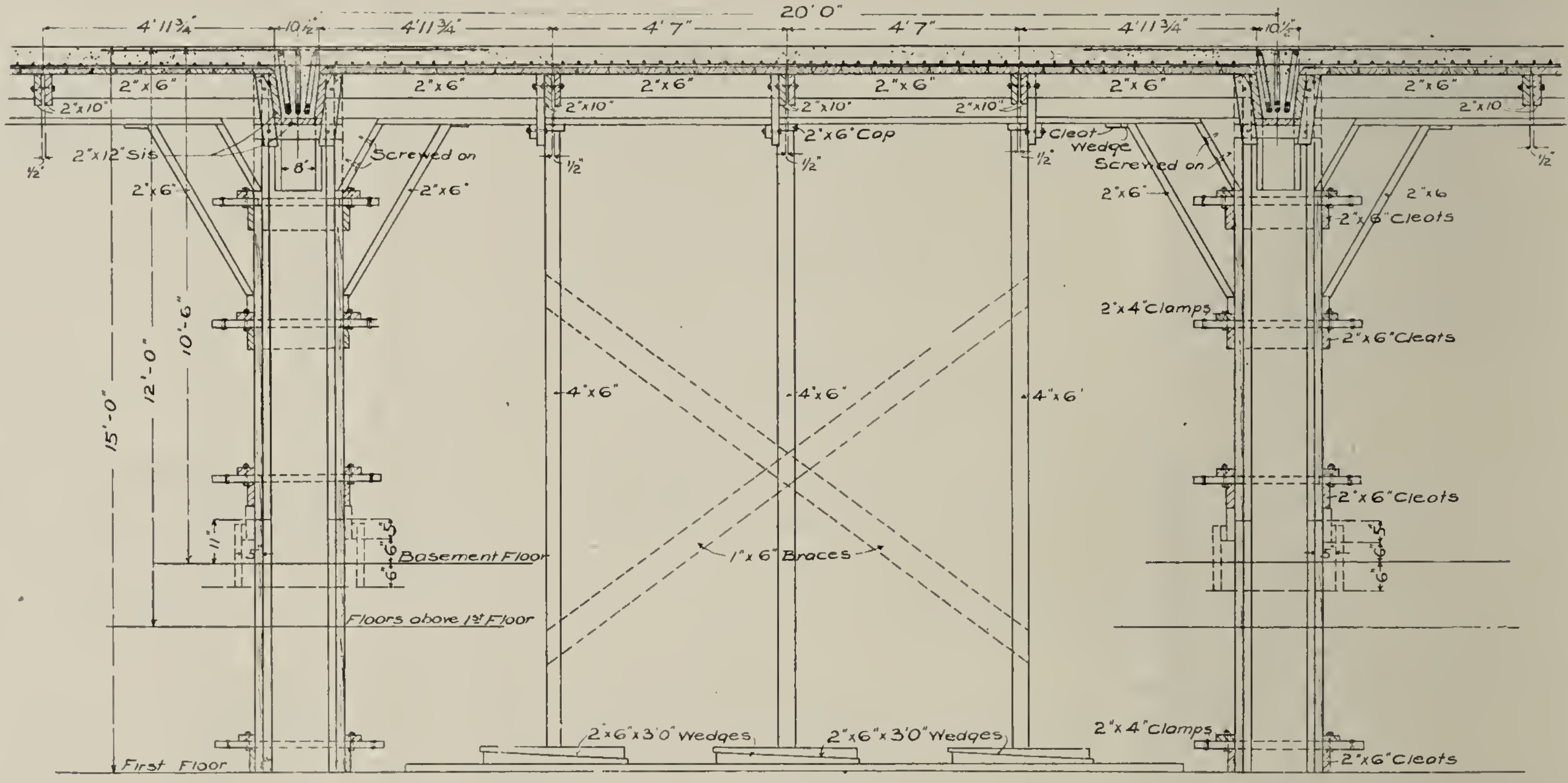


Fig. 4. Elevation of Column, Girder and Floor Moulds.

About fifteen days were required for the building of each story. The concrete was allowed to set for ten days in the molds and Smith mixer was used. The concrete was placed very wet, and was well puddled with rods to make it compact and to get rid of air spaces.

During the construction of the first story, a very severe accidental test proved the stability of this form of construction. The building adjacent, having a limestone front, was being torn down. During the operation a part of the stone front gave way, and fully a ton and a half of the stone fell a distance of 15 ft., landing nearly in the center of the corner floor panel, which had just had the molds removed. No appreciable effect was noted, either then or since. A recent inspection of the building has been made, and there is no sign of settlement anywhere, and no cracks are visible on any of the concrete surfaces.

A two-story building with brick and concrete walls under construction on the courthouse square at Clayton, Mo., collapsed on Oct. 4th during a heavy rain. The brick wall eleven feet high resting on concrete foundations caved in and slid off the concrete base, leaving the concrete walls standing in good condition. When failures such as the above, are carefully sifted down, between brick walls and concrete walls, it will be found that concrete is the most reliable in nine cases out of ten.

MARBLE AND CONCRETE COMPANY.

Jackson, Tenn.—The charter of the Concrete Building and Paving Co. has been amended increasing the capital stock from $15,000 to $30,000, and changing the name to the Jackson Marble and Concrete Co. Officers: Walter Brown, president; J. O. Walker, vice-president; H. C. Jameson, secretary; J. A. Thompson, treasurer; Charles L. McNutt, manager. It is the object of the company to do a general concrete, marble, granite and stone business. They will in the near future build a marble shop on the railroad, and will be in the market for marble and granite tools, pneumatic hammers, derricks, etc.

The Hecla Cement Co. plant is turning out 1,000 barrels of cement per day. The company receives its limestone rock in gondola cars from Alpena. About 75 men are employed in the mill. The mill is still undergoing improvement. Men for this class of work are wanted at the plant and cannot readily be obtained.

The New Castle Portland Cement Co. has held options on several hundred acre tracts of land near Rose Point, Lawrence County, Pa., which have been allowed to lapse on account of unsuitable material. Tests are being made of material found east of Rose Point, in the same county.

The referee in bankruptcy in the matter of the Toledo Portland Cement Co. filed his report with Judge Swain, United States District Court, at Detroit, on September 11th, finding that the cement company could not meet its obligations, and is therefore adjudged a bankrupt.

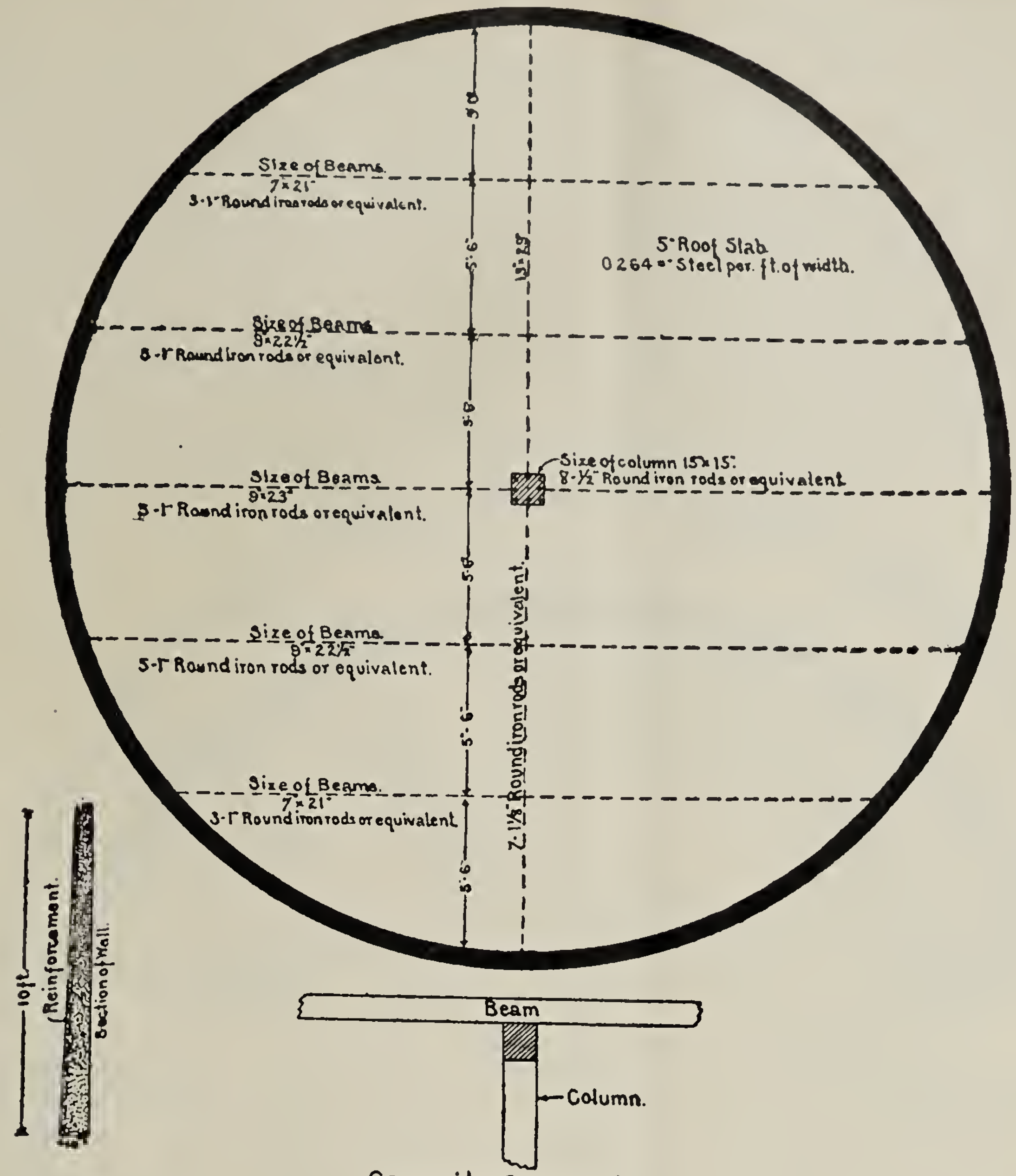
SMALL CONCRETE RESERVOIRS AND VALVE PITS.

The National Fire Protection Association of the United States in 1905 appointed a committee to investigate and report on the subject of material and construction of small reservoirs and valve pits. This committee submitted its report in May of the present year. This report includes plans and specifications as follows:

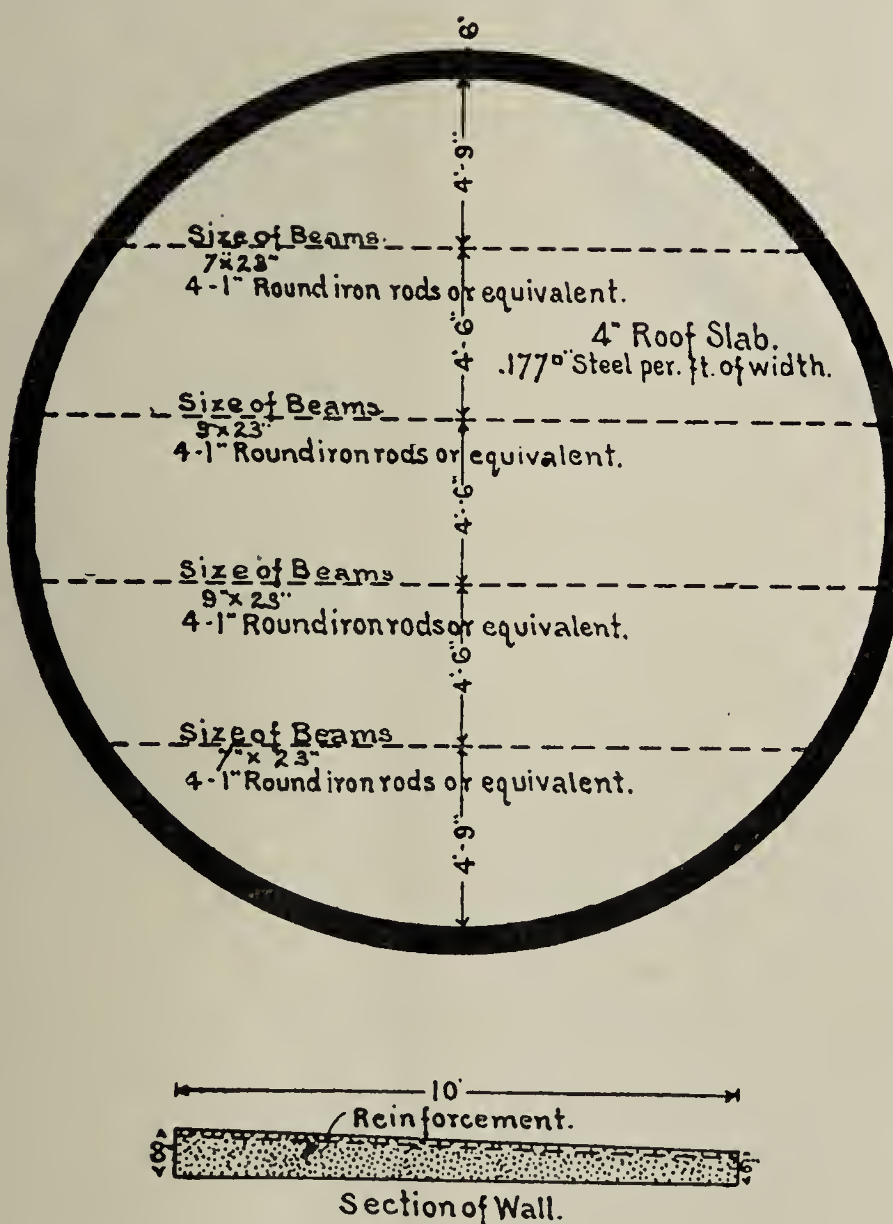
Your committee is of the opinion that reinforced concrete is the best material for the construction of reservoirs, therefore our specifications for reservoirs cover only reinforced concrete. It is the unanimous opinion of concrete engineers consulted by your committee that the circular form is preferable for reservoirs, because the circular tank forms an arch which resists the earth pressure when the tank is empty. Circular tanks can be built for fully 25 per cent less than square sided tanks of equal capacity. The work should be done so as to avoid freezing weather. If the work must be carried on in frosty weather, the concrete must be protected by wooden or canvas shelter and artificially heated."

SPECIFICATIONS FOR RESERVOIRS.

1. EXCAVATIONS. The excavation shall be made at least 2 ft. larger all around than is required for the forms: this will give ample room for removal of forms. The space between outside of concrete wall and earth to be filled with porous material. In cases where the nature of the ground admits, with the written permission of Underwriters having jurisdiction, the excavation can be made to the exact outside diameter of the reservoir, allowing the concrete to be placed directly against the earth banks, thereby avoiding the necessity of using forms for one side of wall.


Size of Beams. 7×21"
3-1" Round iron rods or equivalent.
5" Roof Slab.
0.264 □" Steel per. ft. of width.
Size of Beams. 9×22½"
5-1" Round iron rods or equivalent.
Size of Beams 9×23"
5-1" Round iron rods or equivalent.
Size of column 15×15".
8-½" Round iron rods or equivalent.
Size of Beams. 9×22½"
5-1" Round iron rods or equivalent.
Size of Beams. 7×21"
3-1" Round iron rods or equivalent.
5' 6"
5' 6"
5' 6"
5' 6"
5' 6"
5' 6"
13' 2⅝"
7-1⅛" Round iron rods or equivalent.
10 ft.
Reinforcement.
Section of Wall.
Beam
Column.

Capacity 60,000 gals.


8"
4' 9"
Size of Beams. 7×23"
4-1" Round iron rods or equivalent.
4' 6"
4" Roof Slab.
.177 □" Steel per. ft. of width.
Size of Beams 9×23"
4-1" Round iron rods or equivalent.
4' 6"
Size of Beams 9×23"
4-1" Round iron rods or equivalent.
4' 6"
Size of Beams 7×23"
4-1" Round iron rods or equivalent.
4' 9"
10'
Reinforcement.
8"
6"
Section of Wall.

Capacity 30,000 gals

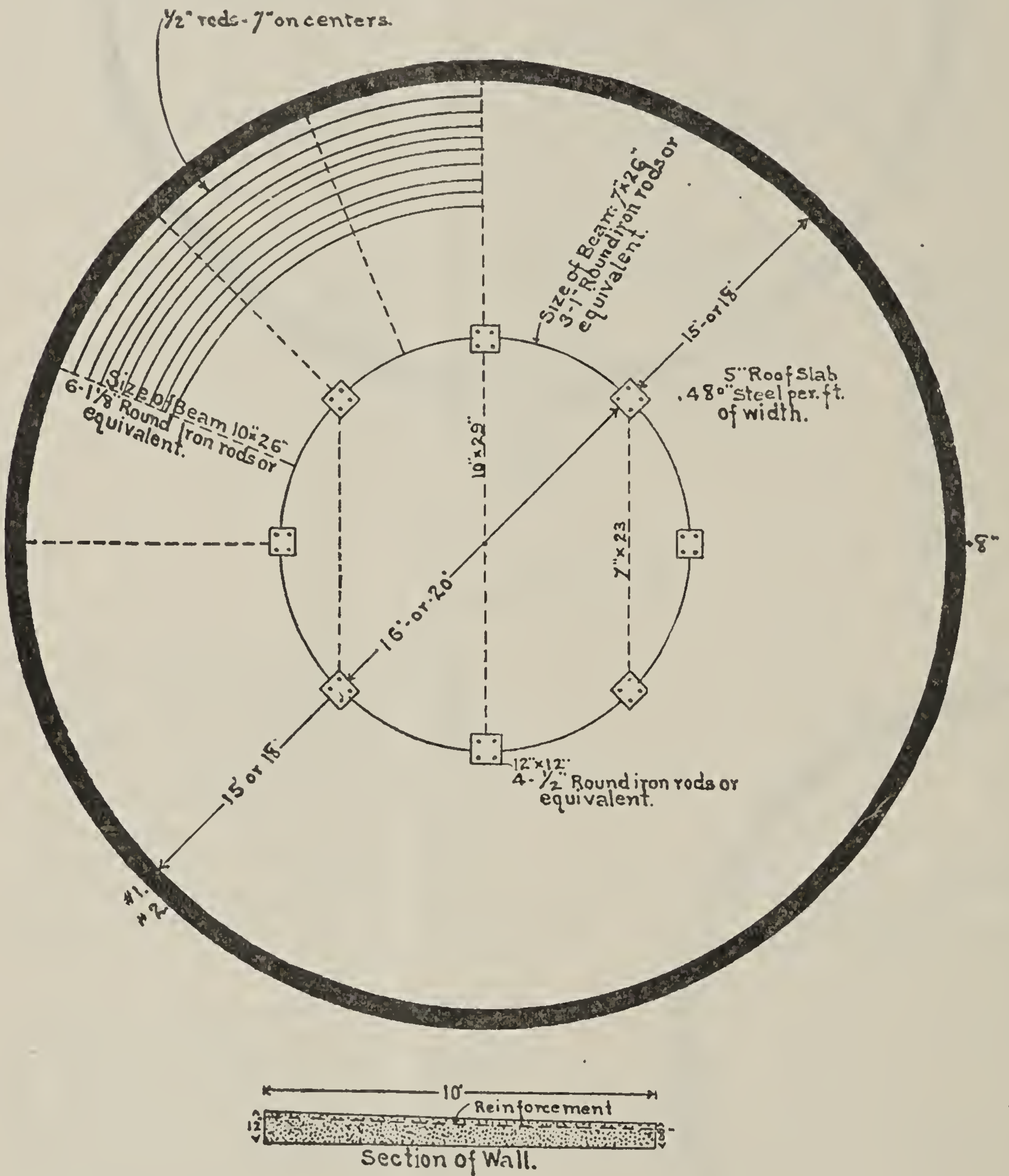
2. FOUNDATION. The following specifications are based on the assumption that the ground will support a load of four tons per square foot. If upon examination it is found that the earth is not strong enough to support safely such a load expert engineering advice must be secured as to the design of proper foundations.

3. CONCRETE. It is extremely difficult to fix definitely a standard of concrete mixture and material owing to the lack of unanimity of opinion among experts and also to the fact that a great variety of mixtures might be safely used, if conscientiously mixed and placed. The fact, however, that poor material and workmanship have often caused the ruin of concrete structures, renders it imperative in these cases that a definite standard be adopted and adhered to, not that some other might not do as well, but rather because safety demands we shall, at least, feel that the

method used is a satisfactory one. We, therefore, recommend the following specifications as a safe standard:

All the concrete shall be made from a mixture of Portland cement, sand and crushed stone or gravel, mixed in the proportion of one part cement, to two and one-half parts sand, and five parts crushed stone or gravel. The cement shall be equal in quality to the best recognized standards of Portland cement in the local market.

The crushed stone shall be sound, hard stone of an approximately cubical shape, containing no particle whose greatest dimension exceeds 2 in., and preferably with graded sizes down to ½ in. It shall be free from dirt or foreign matter and shall contain no crusher dust, unless the percentage of such crusher dust shall be accurately determined, and an allowance made therefor by the reduction of a like amount of sand. If the gravel is used, it shall be thoroughly screened to remove all sand, and shall conform in size to that specified for crushed stone.


½" rods-7" on centers.
Size of Beam 7"x26" 3-1" Round iron rods or equivalent.
15'-or 18'
5" Roof Slab .480" Steel per. ft. of width.
Size of Beam 10"x26" 6-1⅛" Round Iron rods or equivalent.
10"x29"
7"x23
8"
16'-or-20'
15' or 18'
#1. +2
12"x12" 4-½" Round iron rods or equivalent.
10'
Reinforcement
12"
8"
Section of Wall.

Capacity 120,000 Gals.

The ingredients selected as above shall be thoroughly mixed dry, either by hand or machinery, until a uniform distribution of material is obtained, a sufficient amount of clean water being added to produce a concrete of such consistency that it will easily "quake" under light blows of the rammer and without showing a surplus of free water on its top surface.

4. Reservoir Floors. The floor of the reservoir shall have a minimum thickness of 6 in. if a solid, and 12 in. if a pile foundation is used. Floor shall be reinforced by expanded metal or other suitable reinforcement.

Wherever the conditions will admit, the entire floor shall be laid at one time to avoid seams. If necessary to cease work before completing the floor, the concrete shall be stepped off at the edges, and upon starting work again, these edges shall be thoroughly cleaned by washing, and coated with a thin, neat cement grout. The surfaces of the floor shall be neatly graded to produce an uniform pitch to the sump which shall in all cases be placed immediately under the opening in the reservoir roof; sump to consist of a rectangular or square recess at least 3 ft. square and 3 ft. deep.

When piles are used in the foundation, they are to be accurately cut off to a uniform grade. The space between piles shall be excavated to a depth of 6 in. below cut-off and refilled with 4 in. of good, clean, banked gravel, thoroughly rammed, leaving the pile heads projecting 2 in. above the top surface of gravel filling. The floor under piers shall be in all cases at least 12 in. thick.

All concrete shall be placed directly on the bed thus prepared. The surface of the floor shall be finished with at least ½ in. of cement mortar spread before the bottom layer has begun to set, and troweled to a hard, smooth and impervious surface.

5. Reservoir Walls. The dimensions of walls shall be substantially as shown in drawings of standards. They shall be built true to center by means of suitable forms, securely braced against movement. They shall be built in sections of as great height as conditions will allow, care being taken to keep the top surface of concrete approximately level during the process of placing. The surface next to forms shall be thoroughly spaded by means of a suitable spading tool so as to insure a smooth face when the forms are removed. Care shall be exercised to prevent disturbing the position of the reinforcing metal during the placing of concrete. Where sections of walls are stopped, roughing pieces of 2 in. by 4 in. shall be tamped into the top surface to form a horizontal groove in the center of its cross section. On joining the next succeeding section, the roughing pieces shall be removed and the face of the joint carefully cleaned with water and coated with neat cement.

6. Reservoir Roof and Columns. The necessity of a roof for reservoirs shall be determined by underwriters having jurisdiction. If a roof is required, supporting columns shall be constructed as shown in standard drawings for the various sizes of reservoirs.

The forms for the entire roof shall first be built, and if possible, the entire roof placed in one operation. If conditions render it absolutely necessary that a joint be left, the same shall be made on the center line of a beam and great care shall be taken in joining the work so left, to thoroughly roughen the concrete previously placed, to clean and brush same; and finally to apply a plaster of neat cement in advance of placing the concrete.

The forms shall be rigidly supported by bracing of sufficient strength to avoid any movement due to its load, or by vibration. They shall remain in place for at least one week in warm and three weeks in cold weather. In removing the forms, care shall be taken to avoid unduly straining the concrete.

7. Finish. Should porous or void spaces appear when the forms

are removed, the same shall be cut out until solid work is exposed, and the hole thus made filled with a mixture of rich cement or mortar. When the reservoir is completed, it shall be cleaned out and the walls washed with one or more coats of cement applied to the entire surface.

8. REINFORCEMENT. The details of reinforcement shall be as shown in standard drawings. Either plain or distorted rods may be used in beam construction, and if plain, they shall be bent at right angles at the ends to secure anchorage, and prevent possible slipping. Whatever shape of rod is used, the equivalent sectional area shall be maintained to that shown in the standards. In general, the reinforcing metal must be placed on the side opposite to that on which the pressure is applied, not less than 1 in. or more than 2 in. from the face.

Whatever system of reinforcement is used in the design of the work, a factor of safety of not less than five shall be assumed, and 16,000 lbs. per square inch shall be used as a full tensile strength of the reinforcing metal.

9. LEAKAGE. Reservoir must be substantially water tight after having been filled with water fourteen days. Leakage for the first twenty-four hours after filling shall not be more than 5 per cent, water to be drawn off and porous concrete cut out and spaces filled with rich cement mortar.

CAPACITY OF STANDARD REINFORCED CONCRETE RESERVOIRS.

23 ft. diameter by 10 ft. Capacity, 30,000 gals.
33 ft. diameter by 10 ft. Capacity, 60,000 gals.
46 ft. diameter by 10 ft. Capacity, 120,000 gals.
56 ft. diameter by 10 ft. Capacity, 180,000 gals.
64 ft. diameter by 10 ft. Capacity, 240,000 gals.

The above sizes and capacities are merely suggested, but in most cases will prove more economical if specified by Underwriters having jurisdiction, for the reason that contractors may use standard forms, thereby reducing the cost of construction.

SPECIFICATIONS FOR VALVE PITS.

CONCRETE PITS. If of concrete, mixture to be the same as specified for reservoirs. To be sufficiently reinforced to resist overhead strains, such as teaming, if located in driveways. Reinforcement to be figured with a factor of safety of at least five, assuming a live load of 1 ton per sq. ft. of roof slab: 16,000 lbs. per sq. in. shall be used as a full tensile strength of reinforcing metal.

A clear space of at least 12 in. to be provided on all sides of valve or valves which may be located in pits.

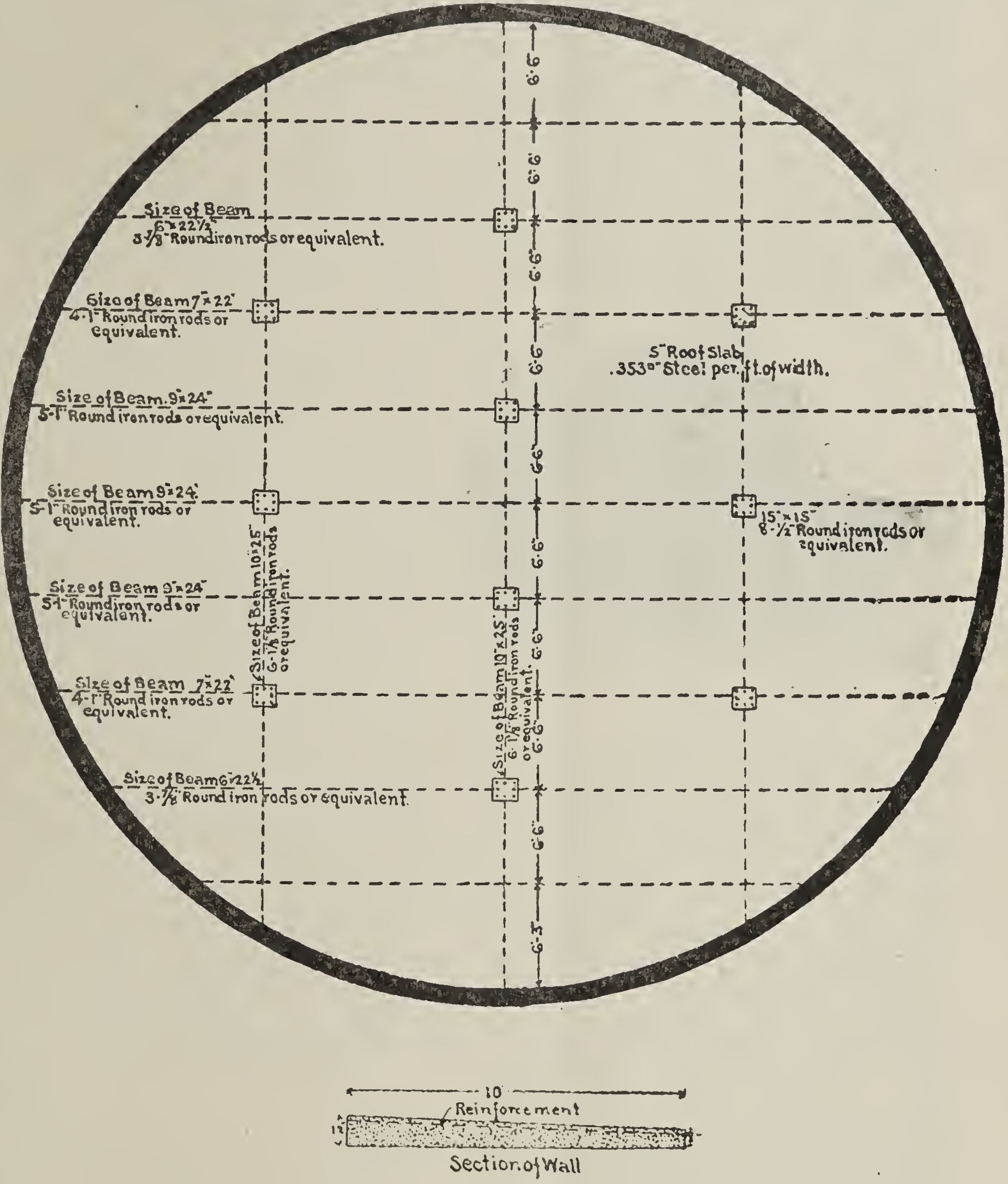
A standard iron manhole and cover to be properly placed in center of each pit, 6 in. below iron cover, a second cover of 2 in. plank to be placed on a ledge formed in the concrete at least 2 in. wide. Space between covers to be filled with some suitable insulating material, such as mineral wool, hair, felt or hay.

Walls and bottom to be not less than 6 in. thick; to be reinforced, if conditions of ground warrant.

BRICK PITS. Walls, bottom and top to be not less than 8 in. thick. Top to be capable of maintaining a live load of 1 ton per sq. ft. of exposed surface. Manhole and cover to be the same as required for concrete pits.

WATERPROOFING OF PITS. If the concrete is constructed in water-bearing ground, the dimensions of the excavation must be such as to allow ample room for applying a coating of some water-proofing compound to the exterior face of the walls and under floor. The water-proofing material shall consist of alternate layers of tarred felt, cemented with coal tarred pitch or other equally efficient water-proofing compound. The water-proofing shall not be applied until the surface of the concrete is thoroughly dried.

It is advisable to fill pits with hay or straw if risk is located in regions where severe cold weather occurs.


Size of Beam 6"×22½" 3-⅞" Round iron rods or equivalent.
Size of Beam 7"×22" 4-1" Round iron rods or equivalent.
Size of Beam 9"×24" 5-1" Round iron rods or equivalent.
Size of Beam 9"×24" 5-1" Round iron rods or equivalent.
Size of Beam 9"×24" 5-1" Round iron rods or equivalent.
Size of Beam 7"×22" 4-1" Round iron rods or equivalent.
Size of Beam 6"×22½" 3-⅞" Round iron rods or equivalent.
Size of Beam 10"×25" 6-1⅛" Round iron rods or equivalent.
Size of Beam 10"×25" 6-1⅛" Round iron rods or equivalent.
5" Roof Slab .353□" Steel per ft. of width.
15"×15" 8-½" Round iron rods or equivalent.
6'-6"
6'-3"
10'
Reinforcement
12"
Section of Wall

Capacity 240,000 gals.

A Portland cement company is being organized at Elk City, Montgomery county, Kan., says the Topeka Capital, for the purpose of erecting a plant on the Sante Fe Railway four miles east of Elk City.

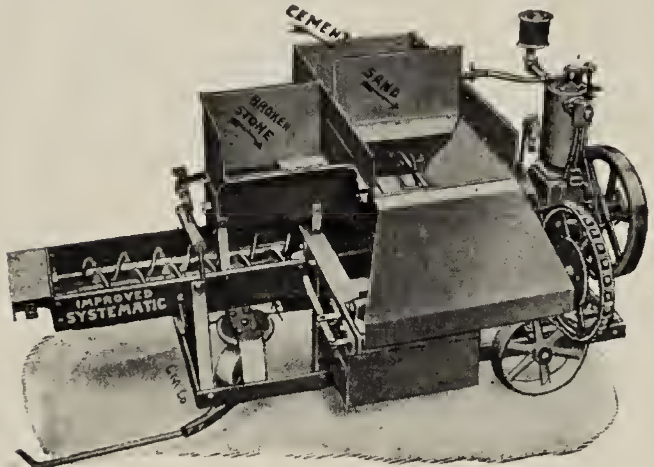
The explosion of a boiler on the Burt Portland Cement Co.'s plant on September 24th, caused the death of one laborer; another employee received fatal injuries. Three other men were seriously scalded.

The Wolverine Portland Cement Co. has declared additional 5 per cent dividends. This makes 20 per cent declared during the season.

THE NEW SYSTEMATIC CONCRETE MIXER.

The Cement Machinery Co. of Jackson, Mich., has placed a new and enlarged Power Concrete Mixer on the market; heretofore a hand power machine only was manufactured. The new and improved machine is operated by four 2 H. P. International Harvester Company gas or gasoline engine which is furnished with each outfit. The special merits of the Systematic Concrete Mixer may be stated as follows:

The sand and cement receives a double dry mix, after which the crushed stone or gravel is added. The concrete can be wet to any desired consistency, from a damp state to a slush by simply opening or closing a valve. The feed can be set to auotmatically proportion the sand, cement gravel or broken stone, to any percentage called for under the most exacting specifications. The sand and cement is first mixed dry by gravity, a double conveyer with especially arranged spiral flights makes the second mix, after which it is wet, and receives a third mix, a double conveyer arranged with the same style of flights being used. These flights are adjustable to suit the size of the materials. They clean themselves while in operation. The operator has complete control of the feed and wetting device at the same time. The mixer can be operated either as a continuous or batch mixer. For mixing dry colors and cement and for producing uniform colored concrete work the mixer is perfection, the exact shade required can be maintained day in and day out. The mixer has a capacity of from 10 to 12 cubic yards per hour with the engine working 400 revolutions per minute. The systematic mixer is well constructed of high grade materials built for wear and tear. Additional information can be obtained by addressing the Cement Machinery Co., Jackson, Mich.



"New Systematic."

The Jeffrey Manufacturing Co., Columbus, Ohio, has established a new branch office at Montreal, Canada, located on Sayanchetiere and Cote streets.

EFFECT OF MOISTURE ON THE STRENGTH AND STIFFNESS OF WOOD.*

Very little is definitely known about the influence of moisture on the strength of wood, even by those experienced in handling the material. Since the whole subject is one of great importance, the Forest Service has been making a thorough study of it during the past three years and is about to publish the results of its investigation in an exhaustive technical bulletin entitled, "Effect of Moisture Upon the Strength and Stiffness of Wood."

The chief points presented by the study are:

1. The relation of moisture to strength follows a definite law which can be graphically expressed. Proper drying very greatly increases the strength of all kinds of wood, the amount of increase in strength depending upon the species and the dryness. The increased strength given to green wood by thoroughly drying it, is so great that it will surprise many. For example, the strength of a piece of unseasoned red spruce may be increased over 400 per cent by a thorough drying at the temperature of boiling water. Strength decreases again, however, as the wood reabsorbs moisture. Air-dried wood, protected from the weather, and containing 12 per cent of moisture, is from 1.7 to 2.4 times stronger than when green, varying with the species. Stiffness is also increased by drying. These conclusions, however, are drawn from small-sized pieces not exceeding 4 by 4 inches in cross-section such as are used in vehicle work, tools, etc. Large timbers require years of drying before the moisture is reduced to the point where strength begins to increase. It must also be taken into consideration that more or less checking always occurs when large timbers dry; and if this checking is excessive it may cause weakness to counterbalance, partially or entirely, the strength gained in drying. Consequently it is not safe to assume that the average strength of large, so-called seasoned timbers is much greater than that of green or wet ones.

2. The fiber saturation point of a number of species has been determined. This point, which varies with conditions and species of wood, designates the percentage of water which will saturate the fibers of the wood. It has been found that, under normal conditions, wood fiber will absorb a definite amount of moisture; beyond this the water simply fills the pores of the wood like honey in honey-comb. Only that water which permeates the wood fiber has an influence upon the strength. For the following species, the saturation point occurs at the given percentage of moisture based on the dry weight of the wood:

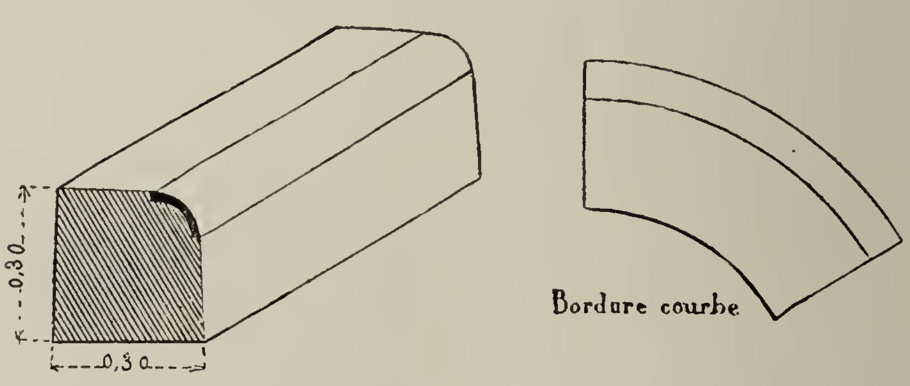
	Per cent moisture.
Longleaf pine	25
Red spruce	31
Chestnut	25
Loblolly pine sapwood	24
Red gum	25
Red fir	23
White ash	20.5
Norway pine	30
Western tamarack	30

3. Prolonged soaking in cold water does not reduce the strength of green wood below that of its fiber saturation point, provided it remains in perfect condition. When wood has been dried and is resoaked, it becomes slightly weaker than when green.

4. Wood soaked in heated water absorbs more moisture because the amount of water which causes a reduction in strength and stiffness, as in wood that is heated or steamed for bending.

IRON PROTECTED CURB AND SIDEWALKS.

Bordures blindées.



The protection of cement and stone street curbing and sidewalks with iron and steel facing, to keep the stone from being injured is very desirable. This iron protected curbing is now extensively used throughout the country, being a patented invention. Numerous lawsuits have been commenced against users of the same; while in fact the invention is an old one, as may be seen from the two cuts shown in connection with this article which are reproduced from a French treatise entitled "Beton Agglomeres," being a communication to the Society of Civil Engineers, by Francois

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*United States Department of Agriculture Bulletin, Forest Service.

Coignet, at Paris, France, on March 19, 1869. This book can be found in the Cement and Engineering News Library. The publication of these cuts and descriptive matter in 1869, under our patent laws, renders any patent invalid for a similar invention.

CONCRETE THE GREAT MODERN INDUSTRY.

The Miracle Pressed Stone Co., with their usual tact and foresight, have issued a large 114-page compendium under the above title, brim full of practical information on the subject of concrete, ancient and modern, with innumerable illustrations of concrete products; including a handsome photographic reproduction of the Pantheon at Rome, built twenty-seven years before the birth of Christ, and which has a hemispherical concrete dome or roof 142 feet 3 inches and now in perfect state of preservation after two thousand years of service. The miracle concrete machinery and special appliances are carefully and accurately described without any extra flourish or exaggeration in plain and direct language that can be readily understood. Standard specifications and builders' guide for cement users are given from the selection of proper materials used in the concrete construction with definitions of the terms commonly employed in concrete construction work. These specifications cover all of the details required in the manufacture of concrete blocks, step by step, until the building is completed, including the coloring of concrete for blocks and ornamental work. Plans and illustrations of concrete block plants. Plans and elevations for cement block houses, which form a special department of the Miracle Pressed Stone Co.'s extensive business. Numerous beautiful buildings, which include residences, factories, stores, churches and theaters, built of the Miracle double staggered, air space, cement building blocks. A complete line of sidewalk tools, and curb and gutter tools, concrete mixers, sewer pipe forms, cement brick machines. The price of each article is given in plain figures, and these are arranged in groups or special outfits. Hitching post moulds, plain and ornamental column molds and lawn vase moulds are all described and illustrated in the Miracle catalogue, which is distributed to intending purchasers at 25c per copy. Address Miracle Pressed Stone Co., Minneapolis, Minn.

EVAPORATION OF WATER.

Experiments made at the Twin Falls Experimental Farm, near Twin Falls, Cassia county, Idaho, on the evaporation of water during four months from May 1 to August 31, 1906.

During May 58 per cent of the water applied to soil was lost by evaporation. In June the loss by evaporation was 65 per cent. In July 88 per cent was lost by evaporation. In August 105 per cent evaporated. That is to say, 5 per cent of the water applied in July was evaporated in August. This having taken place in latitude 42, about the same as Chicago. In orchards, in warm weather, the evaporation from the soil may reach 70 tons of water per acre in 24 hours. This shows the importance of regulating the quantity of water to be applied to concrete during the summer months. The failure of the 250-foot concrete chimney at Peoria, Ill., is in all probability due to the insufficient quantity of water in the concrete, since the failure occurred at the point which was built up during a dry hot day in August, the particular batch of concrete having been mixed in the morning and laid over until after dinner on account of some difficulty in the placing forms, and the concrete becoming too dry. Temperature is the main factor in producing evaporation. Water at 89 Fahrenheit loses seven times as much by evaporation as at 54 Fahrenheit. Many bad jobs of concrete work are undoubtedly due to the evaporation of the moisture either before or after being moulded. Therefore, careful attention should be given to the prevailing temperature, and sufficient water added to offset the evaporation.

The Edison Portland Cement Co. recently blasted 60,000 tons of rock in its quarry at a single charge. A 10-inch hole charged with dynamite, 20 pounds to the ton, made up the charge.

NEW CEMENT WORKS AT CANTON, CHINA.

Plans are under way for a Portland cement plant at Canton, China, to be erected by the provincial authorities. The cement is to be used in the construction of public works, such as wharves and the new Canton water system.

The American Hydraulic Stone Co.'s plant at Chicago has failed, and is now in bankruptcy. Some of the claims against the company are being settled at 40 cents on the dollar. The plant was located at 29th and Ashland avenue, Chicago. This is the second American Hydraulic Stone Company plant that has failed in Chicago. The trade unions and the city building regulations are impediments against the American Hydraulic Stone Co.'s system of building construction. There are a number of plants operating on the American Hydraulic Stone Co.'s system just over the line of the corporate limits of Chicago, but they cannot deliver stone into the city without a special permit for each particular structure. Just how these companies are floated has been a mystery to many people in Chicago. In the city of New York a similar company was organized and capitalized at $250,000 and the money is said to have actually passed while the ordinances of the city of New York are such as to bar the use of their stone, simply because there is not sufficient material in the block forms to meet the requirements of the stringent building laws. We should like to hear from our subscribers just what large cities (Denver excepted) permit the use of the American Hydraulic Stone Company's system. The officers of this company always talk in large figures. They claim to have sold the state of Illinois alone for $75,000. We believe they have received more cash as promoters than any other cement building block concern in the field.

The fire loss in the United States is two hundred and fifty million dollars per year. The total gold production is only one-third of the fire loss, which is equal to $20 on every American family. This is one substantial reason why buildings should be made fireproof, which cement construction is doing much to bring about. There were 6,672 lives lost in connection with fires in 1905.

A gas explosion at the corner of Queen street and Dovecourt road, Toronto, lifted a large section of heavy concrete pavement as high as the fourth story of the Young Men's Christian Association building, breaking twenty-eight windows and doing other damage.

CONCRETE CULVERTS.

The New York state engineering department has prepared plans and specifications for concrete culverts for public highways. We reproduce the plan, and cross section for such culverts which explain themselves. Fig. 1 is a plan showing the various kinds of reinforced concrete used in the slab covering, the amount of metal varying with the span. For a 4-foot span, ¾-inch bars, spaced 7 inches from centers. For a 5-foot span, 1-inch bars; 8-foot span, 1½-inch bars; all spaced 7 inches from center to center.

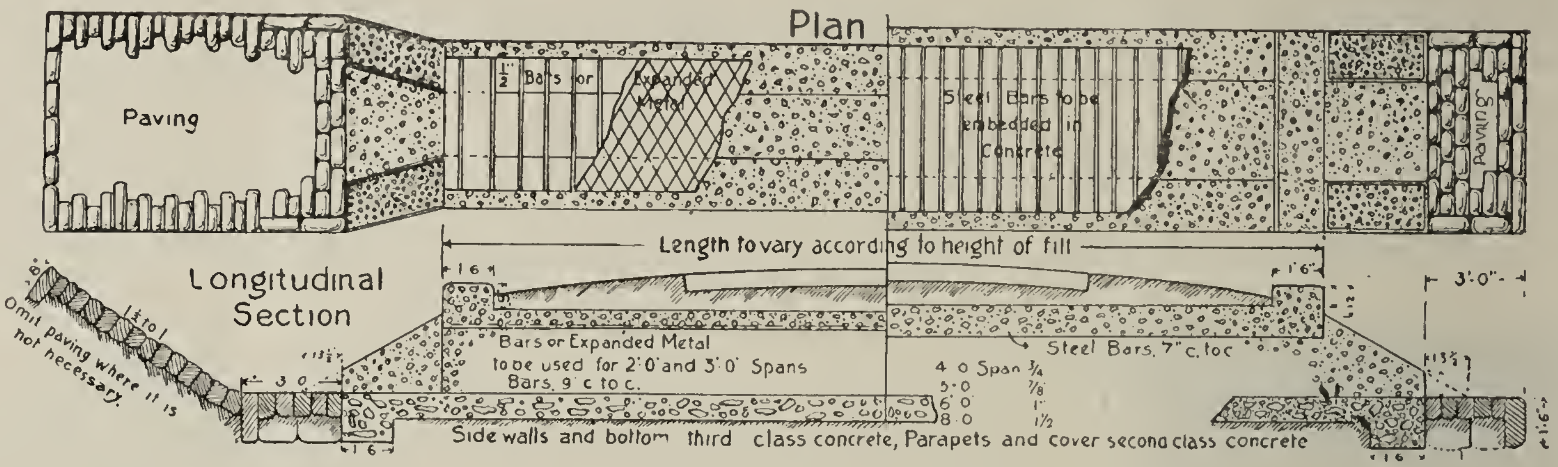

Plan
Paving
½" Bars or Expanded Metal
Steel Bars to be embedded in Concrete
Paving
Length to vary according to height of fill
Longitudinal Section
Omit paving where it is not necessary.
1½ to 1
1 6
1 6"
3'0"
3 0
Bars or Expanded Metal to be used for 2' 0' and 3' 0' Spans Bars, 9" c to c.
Steel Bars, 7" c. to c
4 0 Span ¾
5 0 ⅞
6 0 1"
8 0 1½
Side walls and bottom third class concrete, Parapets and cover second class concrete
1 6

FIG. 1. CONCRETE AND CONCRETE CULVERTS

The walls are built up in wood forms, 5 to 6 feet above the concrete floor. The slab covering varies in thickness according to the span from 6 inches to 12 inches. The thin slabs are moulded in boxes while the heavy 12-inch slabs are built in place. The New York state engineering department recommended the following mixture for this class of work: One part Portland cement, 2½ parts sand, and 5 parts crushed stone, not exceeding 1-inch in size, mixing to be done on a wooden floor or in mixing boxes. The cement and sand first to be mixed dry and water added and again mixed to a thin mortar. The stone after being moistened is covered with the proper amount of mortar, and worked together with shovels or hoes until the crushed stone is thoroughly coated with the mortar to produce a quaking mass in the barrow or pail, but should not be fluid, after which it is deposited in place, and tamped. Or it is put in the forms for moulding thin slabs, in which case a coat of mortar is spread over the bottom of the box form 1¼ inches thick and the metal reinforcing placed thereon, followed by the concrete mix above specified and tamped and smoothed over with a trowel, being careful to see that the edges are filled, after which the work will be left to set and harden.

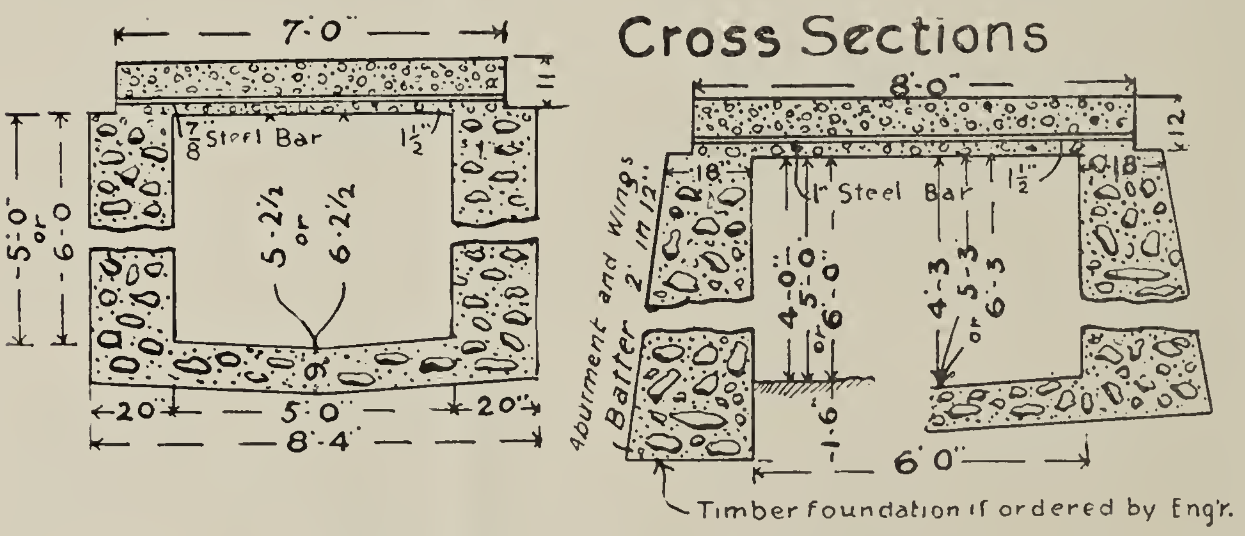


FIG. 2. CONCRETE AND CONCRETE CULVERTS.

The Iowa Enamel Brick & Stone Co. of Des Moines, Iowa, has been organized to manufacture cement enamel stone and brick, plain and ornamental. The officers are W. T. Langan, D. M. Johnson, vice-president; Frederick Field, treasurer; H. S. Clure, Frank Stehm, manager. The company has received a large boost in the local papers, which claim that a single machine is capable of making 10,000 bricks per hour or 80,000 in eight hours. At present the production is 3,000 brick per hour. Each brick or stone will have a smooth, glassy, polished surface, and be absolutely waterproof. Samples shown in Chicago all possess this finish.

The contractor for the Belle Fouche Irrigation Project, South Dakota, is hauling sand six miles over common wagon roads with traction engines. Each train consists of five wagons and one traction engine, loaded with thirty-five cubic yards of sand, which is being used for concrete. The work is being done under the supervision of the United States Reclamation Service.

CONCRETE STEPS.

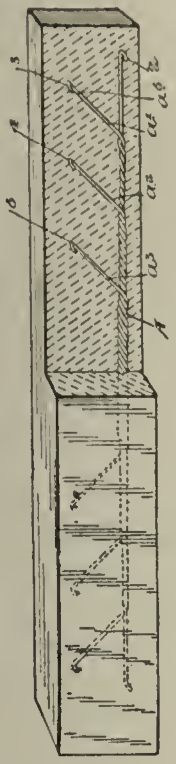
Concrete may be advantageously used in the construction of steps, particularly in damp places, such as areaways and cellars of houses; and in the open, where the ground is terraced, concrete steps and walks can be made exceedingly attractive. Where the ground is firm it may be cut away as nearly as possible in the form of steps, with each step left 2 or 3 inches below its finished level. The steps are formed, beginning at the top, by depositing the concrete behind vertical boards so placed as to give the necessary thickness to the risers and projecting high enough to serve as a guide in leveling off the tread. Such steps may be reinforced where greater strength is desired or where there is danger of cracking, due to settlement of the ground.

Where the nature of the ground will not admit of its being cut away in the form of steps, the risers are molded between two vertical forms. The front one may be a smooth board, but the other should be a piece of thin sheet metal, which is more easily removed after the earth has been tamped in behind it. A simple method of reinforcing steps is to place a half-inch steel rod in each corner, and thread these with quarter-inch rods bent to the shape of the steps, as shown in Fig. 6, the latter being placed about 2 feet apart. For this class of work a rich Portland cement concrete is recommended, with the use of stone or gravel under one-half inch in size. Steps may be given a half-inch wearing surface of cement mortar mixed in the proportion of 1 part cement to 2 parts sand. This system, as well as many others, is well adapted for stairways in houses.

Los Angeles, Cal., is considering the erection of a Portland cement mill in the Owens river valley at the cost of $250,000. Suitable raw cement material having been located at the point named the city expects to use 1,500,000 barrels of cement in the construction of its proposed reservoir and conduit system to supply the city with pure water.

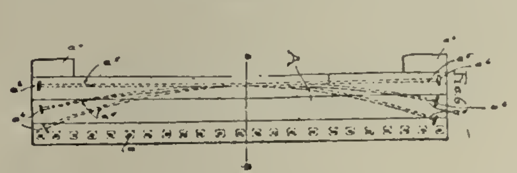
U. S. PATENTS ISSUED ON CONCRETE MACHINERY AND FORMS.

825,884. Reinforcing-Truss for Concrete. Edgar B. Jarvis, Toronto, Canada. Filed Dec. 23, 1904. Renewed Feb. 3, 1906. Serial No. 299,360.



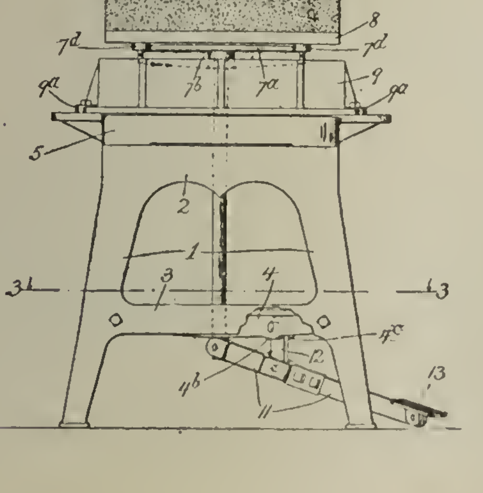
Claim.—1. A reinforcing-truss for concrete comprising a bar made up of a plurality of rods or strands of different lengths, said strands being twisted around each other, the shorter strand being located at the center of the truss and on the outer side thereof and the longest strand forming the inside core and provided with straight ends extending axially of the bar, the said short strand or strands having integral continuations extending obliquely outwardly from the truss, substantially as described.

825,903. Foundation. Lawrence G. Hallberg, Chicago, Ill. Filed April 24, 1903. Serial No. 154,080.



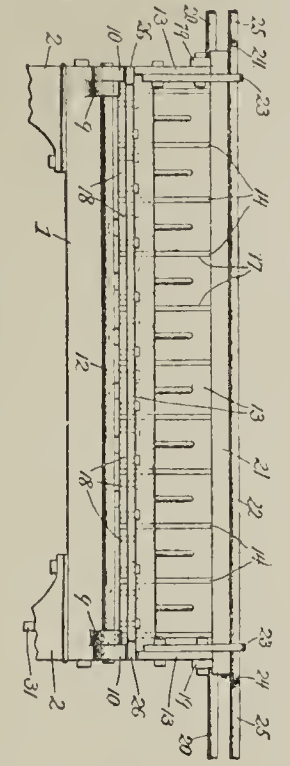
Claim.—A foundation comprising a base of cementitious material, headed anchor-rods embedded therein and disposed substantially transversely to the longitudinal line thereof, and a series of longitudinal headed anchor-rods embedded in the said material and forming a cantaliver.

25,918. Sidewalk-Block-Molding Machine. Arthur P. Melton, Minneapolis, Minn., assignor to Miracle Pressed Stone Company, Sioux Falls, S. D., and Minneapolis, Minn., a corporation of South Dakota. Filed August 18, 1905. Serial No. 274,672.



Claim.—1. In a machine for the purpose stated, in combination with the mold and the stand which supports it; a platen adapted to form a false or movable bottom for the mold, and a platen-lifter movable to carry the platen up through the mold-space, such lifter being an H-shaped frame or spider.

825,919. Brick-Molding Machine. Arthur P. Melton, Minneapolis, Minn., assignor to Miracle Pressed Stone Company, Sioux Falls, S. D., and Minneapolis, Minn., a corporation of South Dakota. Filed December 11, 1905. Serial No. 291,341.

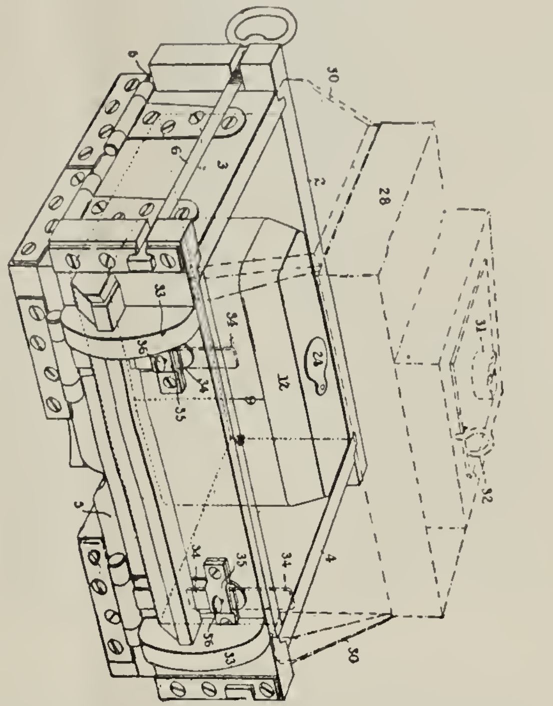


Claim.—1. A brick-molding machine having a mold-box which consists of a movable member and a stationary member, the movable member comprising the bottom and top and one upright wall.

2. A brick-molding machine having a mold-box which consists of a movable member and a stationary member, the stationary member comprising two opposite upright sides and the movable member comprising the top and bottom of the mold-box.

826,381. Method of Making Concrete Slabs or Blocks and Apparatus Thereof. William R. Stanton, James W. Knights and William Drake, Cambridge, England. Filed September 27, 1905. Serial No. 280,357.

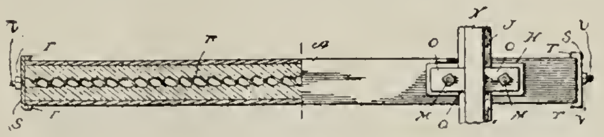
Claim.—1. A core for use in a molding apparatus, consisting in the combination with a vertical-sided casing formed of flexible material locally stiffened on its inner sides and adapted to be collapsed in two directions under external pressure, of a removable cover for said casing adapted to wedge apart the sides of the casing at its upper end, and cam mechanism operated by a rod passing through the cover adapted to expand said sides at the lower part, said rod serving to hold the core upon the casing, and to retain the core as a whole in position within the mold, substantially as specified.



2. In a molding apparatus a core comprising a vertical-sided casing formed of flexible material stiffened on its inner side, the casing being in two parts each capable of being independently collapsed so as to be removable in succession from within molded block or slab, as specified.

826,376. Rail Tie and Fastening. John G. Snyder, Altoona, Pa., assignor of two-fifths to John Woolf Plank, Carlisle, Pa. Filed October 23, 1905. Serial No. 283,956.

Claim.—1. A rail tie and fastening consisting of a casing or shell open at the bottom and having the lower sides formed with inwardly-inclined flanges, said casing being adapted to contain concrete, recesses in the top of said casing adapted to receive the rails, cushions in said recesses, clamping plates secured to the casing and engaging the foot of the rail, and means for securing said plates in position.



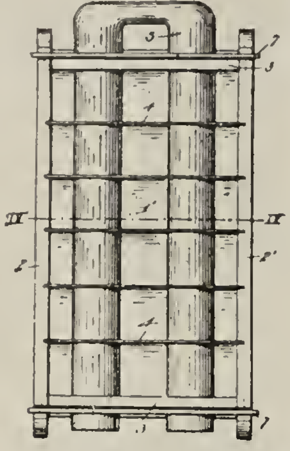
826,467. Mold for Building-Blocks. James M. Bolton, Washington, D. C. Filed October 17, 1905. Serial No. 283,119.

Claim.—1. A block-mold having partitions and means for automatically withdrawing and then releasing the partitions when the mold is opened.

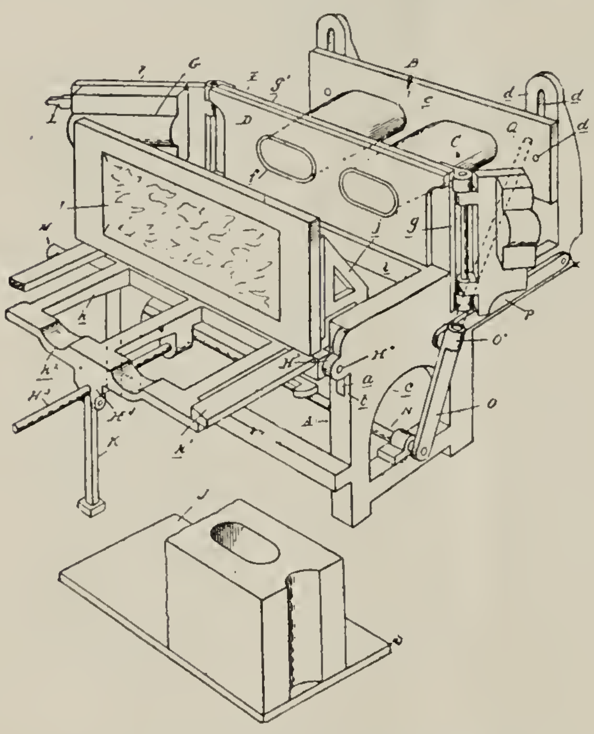
2. A separable block-mold having inclosed sides, partitions and separable connections between said sides and partitions arranged to partially withdraw the partitions when the mold is opened.

3. A separable block-mold having a base, inclosing sides and ends, and

partitions, said ends being constructed to support the sides in proper relation to the base, and connections between the partitions and one side, arranged to automatically withdraw the partitions a predetermined distance, when the mold is opened.

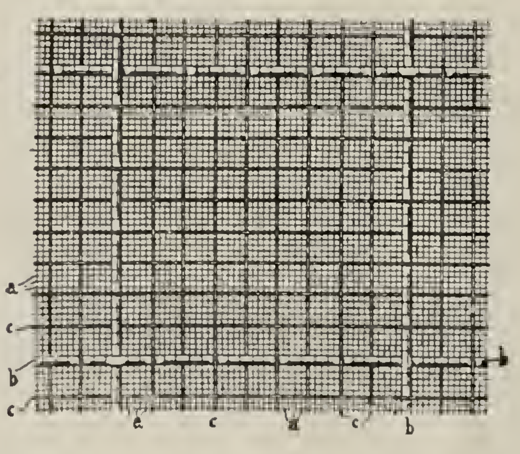


826,599. Machine for Molding Building Blocks. Levi P. Normandin, Jackson, Mich., assignor to William F. Cowham, Jackson, Mich. Filed June 17, 1905. Serial No. 265,774.



In a machine for molding blocks, the combination with a bed, of a plurality of mold sides on opposite sides of said bed and overlapping the edges thereof, and a common member upon which said sides are mounted vertically adjustable upon said bed and constituting a third side of the mold.

826,989. Fabric for Cement Plastering and Concrete. Bussa Von Busse, Marienwerder, Germany. Filed Feb. 5, 1906. Serial No. 299,575.



Claim.—1. A fabric for manufacturing constructions of all kinds, comprising bare wires of different thicknesses, the smaller wires being interwoven among themselves and among the larger wires to form squares, and threads of fibrous material interwoven between said squares, substantially as described.

2. A fabric for manufacturing constructions of all kinds having bare wires of different thicknesses inserted in a fabric of fibrous material, the heavier wires being spaced a certain distance and interwoven and the smaller wires being interwoven among themselves and among the larger wires, substantially as described.

The Pacific Portland Cement Company's oil pumping plant is now in active and successful operation. The oil is transported to Suisun by water, the Standard Oil Company's barge "Benica" making three trips a week. The capacity of the barge is 2,000 barrels and it requires four hours to pump this quantity of oil from the barge through the pipe line into the receiving tank, which is located near the railroad a short distance northeast of the packing house of the Ernst Luehning Company. From the receiving tank the oil is pumped through a pipe line to the cement works about four miles distant. The pumping station is a model of perfection for convenience and economical operation. The building inclosing the plant is constructed of concrete blocks manufactured by the Pacific Portland Cement Company. It is not only a very substantial structure but very imposing and attractive. The machinery embracing the latest improvements in pumping apparatus and its operation is absolutely perfect in every respect. Fred L. Morrill is in charge of the station. The quantity of fuel oil used by the cement company is about 6,000 barrels a week.

The State Board of Health of Kansas has been revising its sanitary regulations. These new regulations require that all slaughter house floors shall be constructed of cement; that all cesspools and vaults must be made watertight; that cement floors must be placed in all stables; that all stable refuse must be removed every twenty-four hours to prevent the breeding of flies.

The Dixie Portland Cement Co. has been organized and will erect a plant at South Pittsburg, Megs county, Tenn., on the Nashville, Chattanooga & St. Louis Ry., being in the extreme southern tier of counties on the Alabama state line. The company has a capitalization of $2,700,000, and has been organized by George E. Nicholson, of Iola, Kan., who, with his associates, controls four other Portland cement concerns, three in Kansas and one in Iowa. The five plants will have an aggregate output of 15,000 barrels of Portland cement a day. The contract for the erection of the plant has been let to the Hunt Engineering Company, of Iola, Kan.

BOOK NOTICES.

A pocket handbook for reinforced concrete construction, in 2 volumes, 852 pages, over 850 illustrations. Price, $1.50. Published by Wilhelm Ernst & Co., Berlin, Germany.___Wilhelm

We cannot say too much in praise of this work. It is the product of the best engineers and specialists in Europe, and of men actively employed in reinforced concrete work. The data it contains is exact and reliable, and covers the entire field of reinforced concrete construction, as it is found to-day. The machinery and appliances used in and about reinforced concrete construction are fully and minutely described, with illustrations. Volume I deals with the principles and engineering calculations upon which reinforced concrete is based, with numerous tables relating to the strength of materials, proper designs for beam girders, columns, arches, bridges. It describes and illustrates forty-five different concrete mixing machines now in use. Volume 2 deals with constructions in reinforced concrete, describing and illustrating in groups all or most every kind of reinforced construction that has heretofore been successfully executed, including a chapter on concrete block and concrete block machinery. While the text of this handbook is in the German language, the illustrations are so numerous and so clear, that they can be readily understood apart from the text. These books should be in the hands of practical men engaged in reinforced concrete construction.

The Steel Square as a Calculating Machine. By Albert Fair. 81 pages, illustrated, 12mo. cloth. Price, 50 cents. New York: The Industrial Publication Co.

This book teaches a new and enlarged use of the common steel square. Elaborate diagrams can be accurately laid out without the aid of the usual mathematical calculations.

Anyone who glances over this book must be struck with the number of difficult problems in all branches of mechanics that may be solved by its aid.

The steel square enlarges the range and scope of work the mechanic can produce without mathematical calculations by simply following the rules laid down for his guidance in the pages of this book. The explanations are full, clear and so simple that any intelligent boy can understand them, and put them in practice.

NEW TENNESSEE CEMENT PLANT.

The Dixie Portland Cement Co., whose plant is to be erected at South Pittsburg, Tenn., will have 10 rotary kilns, 110 feet long and 8 feet in diameter. The power plant will consist of 4,000 h. p. water-tube boilers and cross compound engines of the same capacity; 4 dryers each 60 feet long and 6 feet in diameter. The warehouse will be 105 feet wide by 650 feet long. The Hunt Engineering Co. prepared the plans and will erect the plant. Mr. Ellis Soper, representing the Hunt Engineering Co., is now on the ground.

Cement is selling at Oshkosh at $2.40 per barrel, a raise from $2.10 in June last.

Beloit Concrete Stone Co., Beloit, Wis.; capital stock, $20,000. Incorporators: Ella D. Adams, John H. Adams and W. B. Appleby.

The Crookston, Minn., Journal reports the sale of the Pembina Cement Works at Pembina, N. D., to C. Williams of Grand Forks, N. D.

One hundred million dollars is being expended in new buildings now under way in San Francisco. The best buildings are of reinforced concrete construction.

The employes of the Alma Cement Company returned to their respective tasks at the plant on Oct. 20. The difficulties have been amicably and finally settled at least for a time.

Richmond, Ind., is paving its roadways and alleys with concrete, the top finish being of the same material, after plans and specifications prepared by Harry L. Weber, C. E., of Richmond, Ind.

Work on the new cement chimney stack at the McKinley power station, Peoria, Ill., has commenced. The plans and specifications are the same as for the stack which collapsed in September.

W. H. Ham, formerly reinforced concrete engineer of the Tucker & Vinton corporation, is now the concrete engineer of the General Fireproofing Co., Youngstown.—Iron Trade Review.

The Commercial Cement Co., Ltd., with main office at Winnipeg, Man., has been incorporated. Capital, $150,000. The shares are owned by several leading business men of the Northwestern states.

W. C. Niccolls, 1101 West Calhoun avenue, Springfield, Ill., has commenced the manufacture of cement shingles, and has secured three contracts within three weeks from starting into business.

Otto Babcock, late of North Dakota, is the promoter of the enterprise. The plant will be located in Roseisle township, seventy miles southwest of Winnipeg, on the Carman branch of the Canadian Northern Railway.

San Francisco is to have a new Chinatown, built on strictly oriental lines, an agreement to this effect having been reached by a committee representing the Merchants' Association of San Francisco and the Chinese Merchants' Association.

A simple and effective waterproofing for cement blocks and monolithic work consists of one-half pint of molasses disolved in ten quarts of water and applied as a paint or wash on the inside face of the work. The outer face may likewise be covered.

Engineer McDargh of the Urbana, O., waterworks picked up a dead frog near the pumping station and placed the same in a tin can and surrounded the can with concrete. After the cement had hardened the can was buried in the ground near the McDargh residence. After being buried four years it was taken up and examined. The frog's body was found to be in a perfect state of preservation.

The Lehigh Portland Cement Co. has taken options on 400 acres of land at Mason City, Iowa, just north of the land owned by the Northwestern States Cement Companies' holdings. The options cover the following tracts from J. J. Mayne, 112 acres; E. D. Hughes, 143 acres, and A. G. Purdy, 80 acres, and several smaller tracts. The contract price varies from $1.50 to $2.00 per acre. The Lehigh Company has been represented by A. G. Fisk. The Mayne farm is said to be the key to the Lehigh Company's holding, being crossed by three railways—the Iowa Central, the Great Western, and the Chicago & Northwestern Ry.

The Miller Paving Co. of Memphis has been awarded the contract for improving the United States customhouse grounds at Memphis, Tenn. The work consists in part of concrete drainage channels around the federal building, a beautiful concrete bench across the entire block fronting on the Mississippi river between Jefferson and Union streets, which will furnish seating capacity for several hundred people.

Hollow Concrete Block Building Construction

By Spencer B. Newberry

Illustrated. Covers in detail. Materials, cement and aggregates. Process of manufacture to obtain the best results. Waterproofing mixtures. Classification of machines. Hand and machine tamping. Crushing strength. Handling and storing. Table of mixtures. Strength with sand and gravel, or limestone screenings. Cost of materials. Fine sand mixtures. Absorption, porosity and permeability. Color mixtures. Estimates, labor and materials. Comparative cost of brick and concrete blocks laid up in walls. Reprohuction of concrete in various patterns, shapes and designs.

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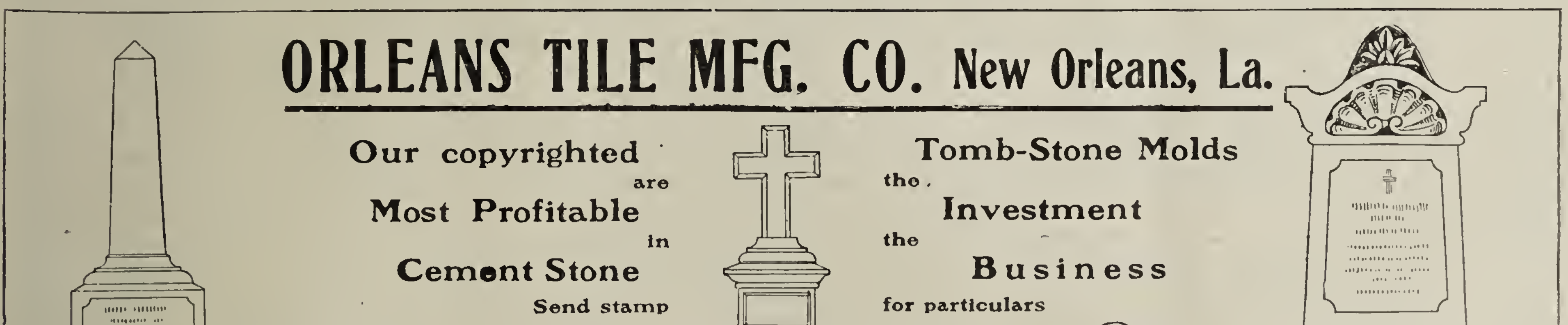

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POSITION wanted as Superintendent of an artificial stone or hollow block plant. Experience, 9 years in Germany and 5 years in the United States and Canada; understands every particular in that work, dry and wet process, (Stevens.) Competent to take entire charge. First-class references. Address Box C, care of CEMENT AND ENGINEERING NEWS.

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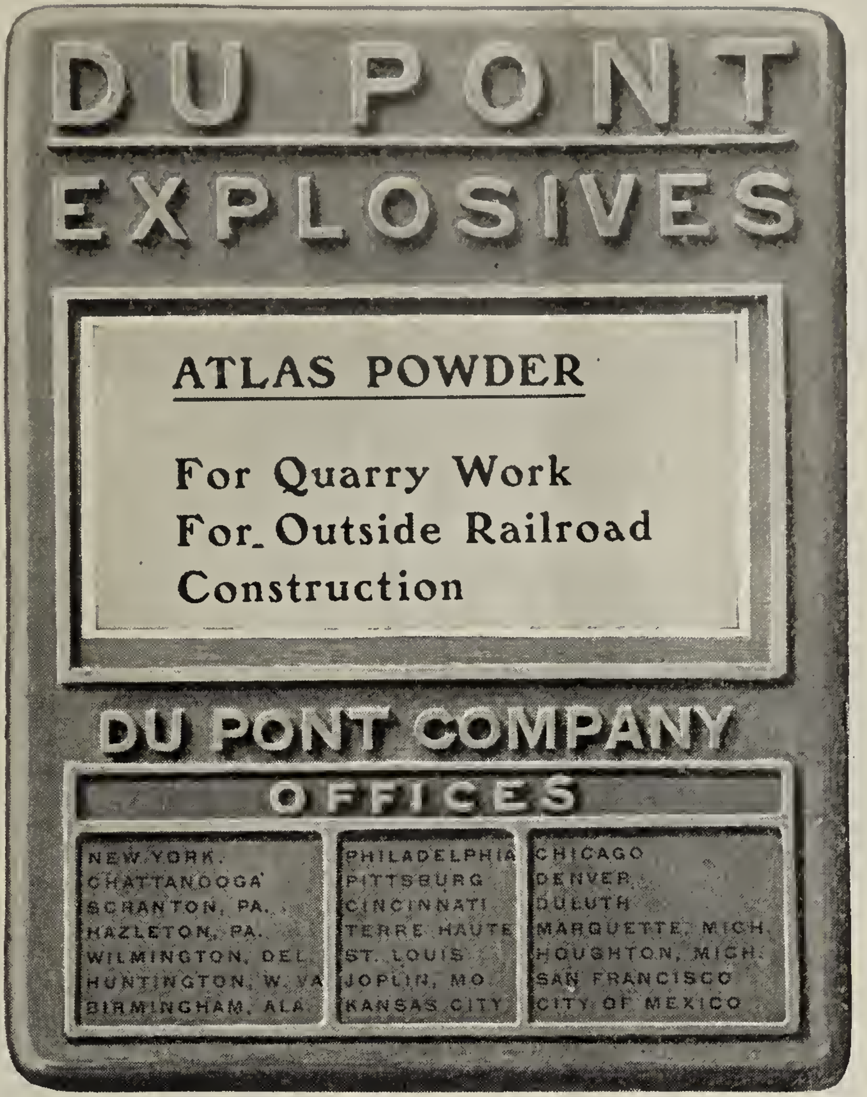

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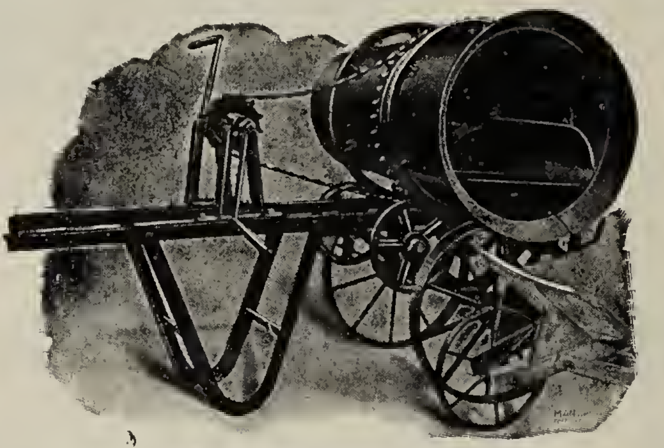

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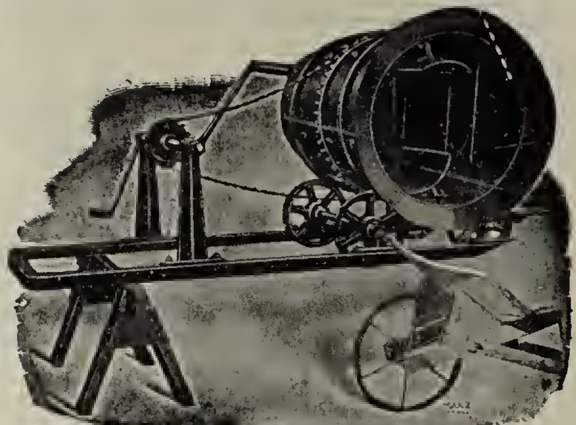

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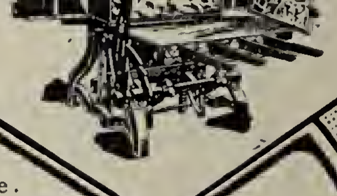

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The Kansas City Portland Cement Works, now under construction near Independence, Mo., is nearing completion. The greater part of the buildings have been enclosed and the most of the machinery installed.

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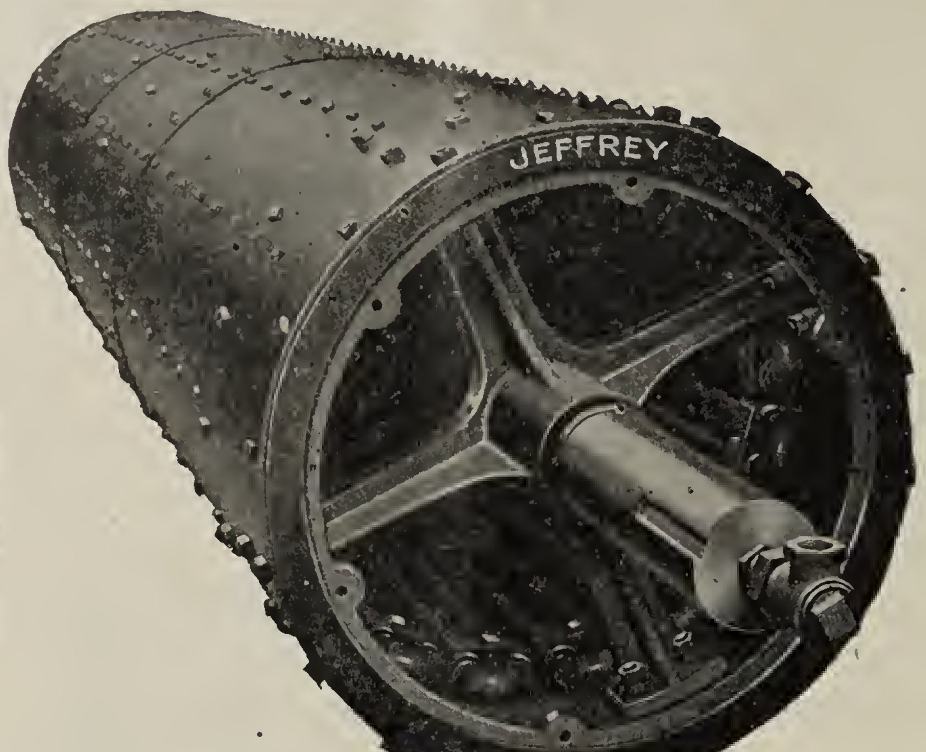

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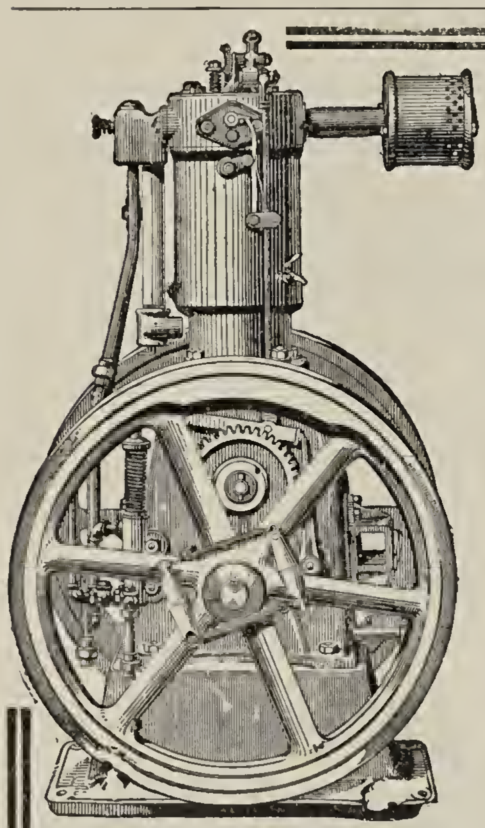

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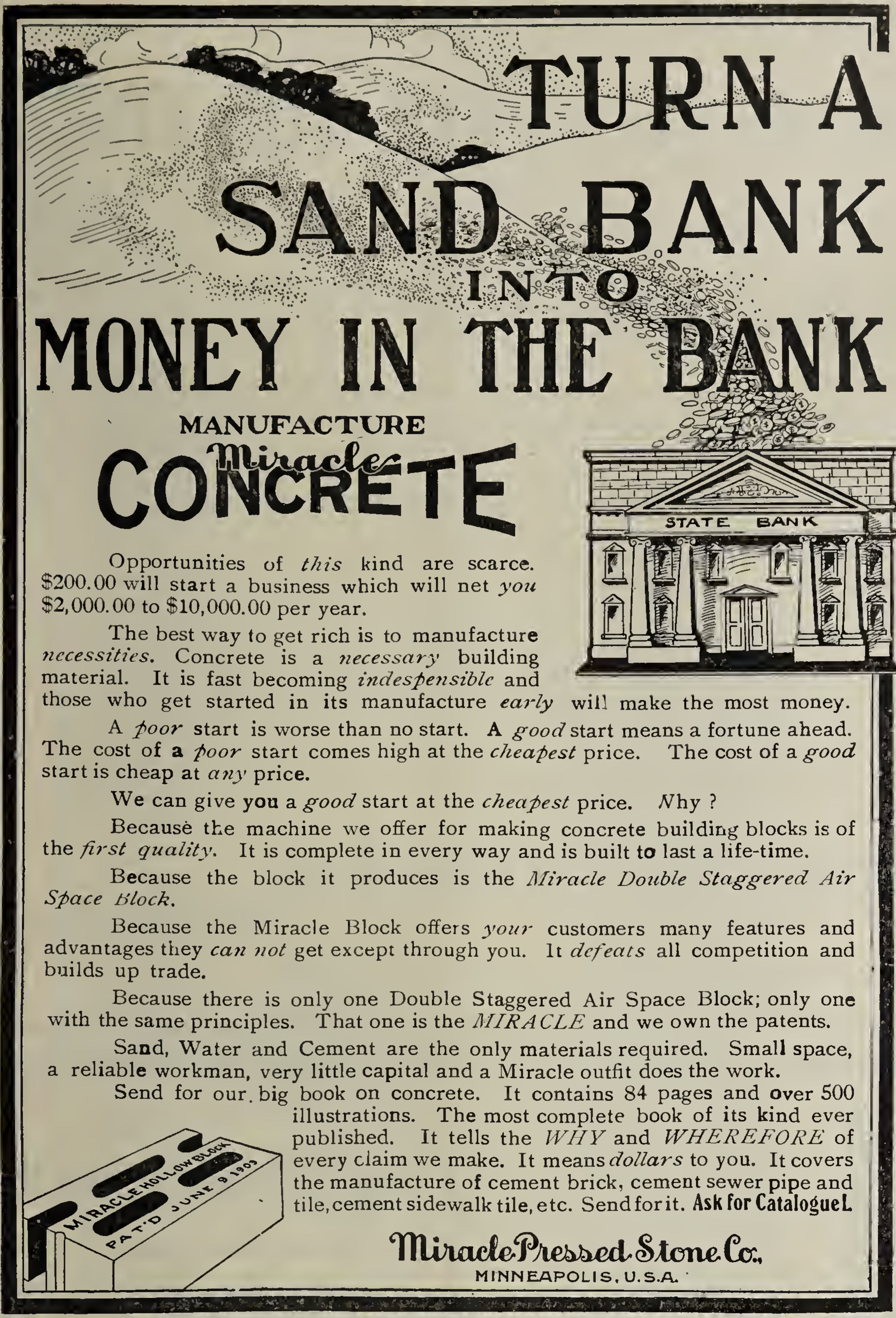

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Blocks of EVERY SIZE, LENGTH, ANGLE, HEIGHTH and CONTOUR produced with ASTONISHING EASE AND RAPIDITY.

A MARVEL OF INGENIOUS ATTACHMENTS to the machine which has made more buildings than all infringers and imitators combined.

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We agree to prosecute infringers. Many already enjoined. Many suits pending.

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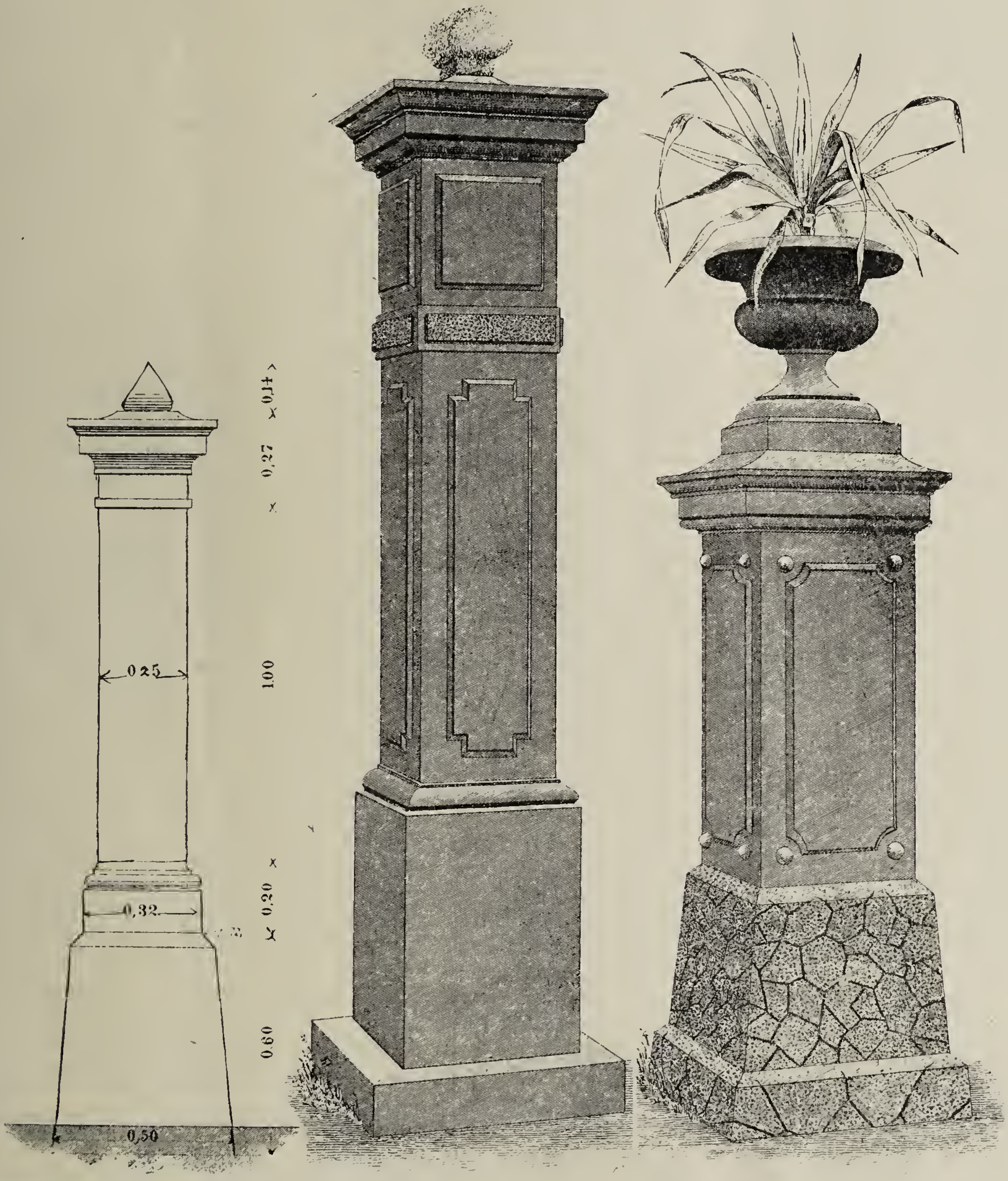

Fig. 5. Ornamental Concrete Gate Post and Pedestal for Flower Vase. Manufactured by J. Ruoff. See description Page 266.

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We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE RECLAMATION OF ARID LANDS.

Millions of dollars are being annually spent in the reclamation of arid lands in the west by the government. Great dams are being built to empound the waters which heretofore have gone to waste. Sluiceways, concrete weirs and abuttments, cement flumes and pipes, headworks and dikes for changing the river channel, all calling for the extensive use of concrete, are under way. The system under which the government operates in constructing its reclamation projects is substantially as follows: The United States reclamation service under the department of the interior, after locating an irrigation project, makes surveys, plans, specifications, and estimates of the cost, after which congress makes an appropriation for the work, which is then advertised. All bids must be made on blank forms furnished by the government. The work is usually subdivided and itemized under three schedules, or two or more schedules may be let in the same contract, at the option of the government. Each bid must be accompanied by a certified check ranging from $500 to $4,500 or more, depending upon the amount of the contract. Each bid must be accompanied by a guarantee of responsible sureties to furnish the bond required ranging from $3,000 to $30,000 or more. The transfer of a contract or any interest therein is prohibited by law. Labor on construction work limited to eight hours per day. No Mongolian labor or imported foreign laborers or convict labor can be employed. The work is carried on under the direct supervision of engineers and inspectors appointed by the secretary of the interior. After the irrigation project is completed and the cost of the same ascertained, the entire amount is spread over the lands to be irrigated at a fixed sum per acre. The cost to the farmer varies from about $15 to $40 per acre, payable in ten annual installments; the failure to make any two payments when due may forfeit the water right. When the full ten annual installments for the greater portion of the land have been made, the operation and management of the irrigation system passes to the owners of the land irrigated (exclusive of the storage reservoirs), to be maintained and operated at their expense. The cost then will be a pro rata share of the actual expenses. In this way the original outlay of the government will be repaid. The government does not deal directly with individual land owners, but with a water users' association in which all of the land owners within the scope of the project become shareholders. The officials of the association make the collections of the yearly installments from the farmers and pay the government the entire bill. The farmers receive the water from the main or the branch canal through a gate at the edge of the canal into their own private ditches. The water is measured in weir boxes and charged up to the farmer. Where the private ditches are simply open earth excavations considerable waste results. In order to prevent this, the ditch is lined with cement, especially where water is valuable. Heretofore wood lined ditches or flumes have been used. This being short lived, concrete is taking its place. Cement flumes, a cross section of which we illustrate, conveying one and one-quarter inch pipe, which discharges into furrows; wooden flumes not being water tight are now lined with cement, cement mortar, asphalt, heavy crude oil, or clay. Cement pipes are often substituted for the open earth ditch. The farmer, who is chiefly concerned in cutting down the waste of water in his own private ditches on his farm, finds it economical to use cement very extensively to overcome this waste. The large private water companies are now lining their large main canals and lateral ditches with concrete. The high price of cement in the west during the past season has restricted the work very much. The same is true of the government work. Many projects are being delayed on account of the cement famine.

THE NATIONAL ASSOCIATION OF CEMENT USERS' CONVENTION.

The third annual convention of the National Cement Users Association will be held at Chicago, January 7 to 12, 1907, inclusive. The Seventh Regiment Armory, otherwise and more familiarly known as Tattersall's, located at 16th and Dearborn streets, will be devoted exclusively to exhibits. The hall space is cut up into 137 different sections, or divisions, which is to be sold at about $3,900 to the exhibitors.

There is a strong feeling that the exhibitors are being worked to the limit, considering the fact that the local Chicago committee furnish the exhibition hall free and pay incidental expenses besides.

The convention will meet in morning sessions only at the Auditorium Hotel, corner of Michigan avenue and Congress street. The first meeting will be called to order at 10 a. m., January 8, 1907. The last meeting will be a special evening session on January 11. There will be no afternoon sessions.

Let there be a full attendance.

ALUMINUM PRODUCTION.

The United States is the largest producer and consumer in the world. The Pittsburg Reduction Company is the only producer in this country. Its plants are located at New Kensington, Pa.; Niagara Falls, N. Y.; East St. Louis, Ill.; and Bauxite, Ark. In 1905 we produced 11,347,000 pounds. The statistics for 1903 are more complete, and include the world's production, in which year we produced 7,498,068 pounds, valued at $2,325,000. Switzerland produced 2,500 tons, valued at $1,413,125; France 1,700 tons, valued at $849,025; the United Kingdom 650 tons, valued at $328,250.

The principal raw material from which aluminum is manufactured is bauxite, which is mined in Alabama, Georgia, and Arkansas. In 1905 our bauxite output was 48,129 tons, valued at $240,292. We imported 11,726 tons of bauxite in 1905, valued at $46,517. Aluminum has sold as low as 28 cents per pound in ton lots to 37 cents in small lots. During the present year the demand for aluminum has been so strong as to practically restrict sales to small dealers, the works being far behind their orders. A new use for aluminum has been invented by Dr. Goldschmidt for melting and welding iron and steel. The compound is known as thermit, composed of four parts of powdered aluminum and one part of oxide of iron, mixed mechanically and placed in a crucible with iron or steel. Will melt the steel in less than one minute. By this process the largest ocean going steam ship propeller shafts can be welded at sea in a few minutes. Thermit is now extensively used in welding large masses of iron on land. Our aluminum exports for 1905 were valued at $290,777.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

MEASUREMENT OF NATURAL GAS.

The U. S. geological survey heretofore has published statistics on the value of gas consumed. In 1906 statistics of the quantity of gas consumed will be compiled.

An effort will be made to collect and publish statistics showing the total acreage held by natural gas companies and the acreage operated by them, with the total quantity of gas consumed in the different states. Owing to the fact that gas wells from different fields are connected to the main pipe lines, and that gas is only measured where consumed, it is now almost impossible to procure exact figures as to the quantity of gas produced from any particular district.

When natural gas was first brought into use an idea prevailed that the supply was inexhaustible. It was sold at low rates and usually without measurement. This method encouraged waste in the consumption of natural gas and was shortly abandoned by the larger companies. They introduced meters and sold their gas at a rate per thousand feet by measurement. There were, however, so many smaller companies that did not measure the gas consumed that it was impossible to secure reliable figures of the production and consumption of natural gas in thousands of cubic feet. For this reason the statistics of this valuable product have been collected in terms of value.

In taking only the value of the product, however, as a basis for statistical record an incorrect idea is given of the actual production of the gas fields, for with the diminution in volume the price has been increased, and in recent years in some cases an increased value is shown where there has been a decided falling off in the production of gas. Experience has demonstrated that there is a limit to the production of all fields, and those who handle the gas have learned that the unnecessary waste of this valuable resource must be prevented. To-day nearly all consumtion is sold by measurement. It is believed that the time has come when it is possible to procure statistics of the quantity of gas consumed.

The total coal receipts at Chicago for nine months ending September, 1906, were 8,838,073 tons. This includes 273,528 tons of coke, 1,389,817 tons of anthracite, 633,556 tons of bituminous from Pennsylvania, 621,348 tons of bituminous from Ohio, 669,711 tons from West Virginia, 3,510,016 tons Illinois coal, 2,144,073 tons Indiana bituminous.

The total anthracite coal shipment from January to September, 1906, from the mines was 40,244,347 tons.

HEAVY DUTY CORLISS ENGINES.

The Wisconsin Engine Company of Corliss, Wis., has issued an illustrated fifty-seven page supplementary catalogue, designated as E-3, describing the distinctive features of their heavy duty Corliss engines up to 5,000 horsepower, with speeds up to 150 revolutions per minute, this speed being quite practicable with the releasing gear and multipolor steam and exhaust valves used on all sizes of engines built by them for direct connected work. The angular motions of the valve gear are reduced by this construction so that rotative speeds up to 150 revolutions per minute are easily obtained. The workmanship, material, and design are guaranteed to be first class in every respect. The engines for the Northwestern States Portland Cement Company at Mason City, Ia., will be furnished by the Wisconsin Engine Company. The National Tube Company, Lorain, O., has given repeat orders for these engines. The Public Service Corporation of New Jersey has installed six 2,500 horsepower engines built by this company. Mr. Frank Engelhardt, 735 Marquette building, represents the company at Chicago.

CONSUMPTION OF RAILROAD TIES.

The American railroad companies in 1905 purchased over ninety-one million wooden ties. The yearly increase of railway mileage and the constant decrease of suitable timber for the manufacture of railway ties will soon compel the railway companies to use either steel or concrete ties. While the steel tie answers very well so far as strength is concerned, it lacks durability, while the concrete tie is absolutely durable. The tendency in steel is upward, while concrete products are declining in price. The future material for ties points unmistakably to concrete. Assuming that ninety-one million of concrete ties would be required each year, and that one barrel of cement would be required to manufacture five ties, no less than 18,200,000 barrels of cement would be consumed in the production of ninety-one million concrete ties. This is nearly one-half of the present output of Portland cement in this country.

MEDUSA WATERPROOFING.

The International Harvester Company erected a large 180,000 gallon concrete reservoir after plans and specifications by W. D. Price, C. E., who likewise superintended its construction. The company was never able to maintain a full head of water in this reservoir until after Mr. Price applied the Medusa waterproof compound, which cured the leaks. A full head of water can now be maintained without loss, the reservoir being perfectly water tight.

W. W. Curtis, C. E., of Chicago has been appointed secretary of the Cement Users' Association. Vice President Carroll Brown has resigned. Mr. Brown is entitled to great credit in bringing the cement users together and to the formation of the present organization.

H. E. Turner of New York City has been selected to succeed Mr. Gammage of Norfolk as treasurer of the Cement Users' Association. Mr. Turner is well known as one of the leading contractors in concrete and reinforced concrete in the east, and possesses eminent business qualifications, and will certainly render good account of himself in the execution of the trust imposed as treasurer of the Cement Users' Association.

San Francisco is being rebuilt at a rapid rate. Permits filed with the board of public works during the seven weeks preceding November 7 call for the erection of buildings to cost nearly thirteen million dollars.

Lipsett & Sinclair of Muskegon, Mich., operating a cement brick and block plant, have secured an order for 90,000 cement brick for the new French church at Muskegon.

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	SEPTEMBER				NINE MONTHS ENDING SEPTEMBER			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	1,000	$ 57	57,861,850	$174,340	6,895,800	$ 21,817	125,273,746	$ 367,711
Belgium...........	30,194,147	102,134	25,962,289	83,185	105,444,695	334,941	138,872,533	483,514
France............	1,189,900	4,332	645,166	1,614	5,513,800	19,653	11,630,972	38,101
Germany...........	8,853,995	25,680	39,702,012	116,714	105,686,079	350,543	181,590,257	596,102
All Other Europe.	....	......	9,921	96	240,659	609	298,253	920
British North Am.	2,050	19	200,020	1,490	129,710	1,387	2,655,340	18,408
Other Countries..	315	2	6,425,586	30,027	469,615	1,783	59,700,402	273,616
TOTAL..........	40,241,407	$132,224	130,806,844	$407,466	224,380,358	$730,733	520,021,503	$1,778,372
Domestic Exports of Cement, bbls.	86,796	$132,502	50,645	$82,929	801,381	$1,086,014	448,340	$714,187

There were 6,863,872 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Sept. 1905, valued at $20,995, against 11,280,987 lbs. in Sept. 1906, valued at $33,901.

For 9 months ending in Sept 1905, there were 77,109 tons of asphalten imported in the United States, valued at $326,440 against 71,300, tons imported in 9 months ending Sept. 1906, valued at $288,338.

DR. W. MICHAELIS, SEN., CONSTITUTION OF HYDRAULIC CEMENTS.

Editor Cement and Engineering News: Your issue of June last contains an elaborate paper on the "Constitution of Hydraulic Cements," by Dr. W. Michaelis Sen of Germany.

As briefly as possible I desire to point out what I consider a serious error in the method employed by the doctor in showing the injurious effects of the presence of magnesia in a Portland cement.

For this purpose we may confine ourselves to page 145, and we herewith quote the three analyses as shown on that page:

	A	B	C
Silica	22.80	19.43	16.12
Alumina	5.59	5.03	4.08
Iron oxide......	2.88	2.62	2.30
Lime	64.11	55.51	46.12
Magnesia	1.10	15.60	30.05
Calcium sulphate	1.90	1.45	1.22
Calcium sulphide.	0.95	....	....
	99.33	99.64	99.89

Analysis "A" was made from a normal Portland mixture, "B" and "C" being the same as "A" with the addition of about 16 per cent and 30 per cent of magnesia respectively.

In "A" the amount of lime with the magnesia is fully up to the limit of combining proportions—namely: 65.21 per cent. But in "B" these two ingredients amount to 71.11 per cent, and in "C" to 76.17 per cent.

When subjected to tests "A" came out all right, but "B" and "C" behaved badly, whereupon the doctor tells us: "By the foregoing I trust to have proven that I am right in treating the magnesia in Portland cement as not equivalent to the lime, and in describing it as an ingredient which is unable to form hydraulic compounds with silica, evidently because the lime monopolizes the silica."

Had the doctor kept the same per cent of lime and magnesia in all three of the samples by deducting from the lime in "B" and "C" an amount equal to the added magnesia, thus keeping the lime and magnesia in "B" and "C" down to 65 per cent, as in "A," he might have experienced far different results. He would have found with "B" at least a good sound Portland clinker; and had "C" contained lime 45 per cent and magnesia 20 per cent, he might have produced a heavy, sound clinker, which when ground and thoroughly hydrated would expand no more than the cement under "A."

Had the 16 to 30 per cent additions to "B" and "C" consisted of lime instead of magnesia, is it not more than probable that the doctor would have met with practically the same results as those recorded for the magnesian mixtures?

Is it not passing strange that all the published tests going to prove that magnesia is inert in cements are shown to have the magnesia added to a normal Portland mixture? Of course the results are disastrous in such cases, and so public opinion is established and the fallacy that magnesia does not combine with silica, in the presence of lime, is perpetuated.

Such chemical combinations occur in nature as in actinolite, $Ca\ (MgFe)_3\ Si_4\ O_{12}$, and in tremolite, $Ca\ Mg_3\ Si_4\ O_{12}$. These silicates are combined under a high heat, as is the case with the Portland silicates.

In the tremolite the magnesia is present in quantity more than double that of the lime, and yet we do not think any one will be found to argue that it is in a free and uncombined condition.

Neither is it maintained that where magnesian limestone is used as a flux in blast furnaces that the magnesia remains uncombined in the resultant slag.

It is well known that a pure dolomite will take up a greater per cent of silica in the formation of furnace slag than will a pure limestone, because of the fact that, while 1,000 pounds of lime will take up but 536 pounds of silica, 1,000 pounds of magnesia will take up 752 pounds.

A cement which contains but 45 per cent of lime and no magnesia cannot be induced by any degree of heat to form a heavy clinker, the result being a light puffy mass which will not set and if exposed to the air will soon disintegrate.

And yet a cement containing 45 per cent of lime and 20 per cent of magnesia will sustain a white heat in calcination and form a heavy solid and exceedingly hard clinker, which will not disintegrate in the air and when ground will set as hard as any Portland; and when thoroughly hydrated will not expand in masonry or concrete.

The writer has had such a cement under his personal observation during the past twenty-five years and has yet to note signs of disintegration and decay.

It is but natural therefore that we desire to raise a mild protest against the practice of adding large quantities of magnesia to a normal Portland mixture and exhibiting it as proof that magnesia is free and uncombined in hydraulic cements.

Uriah Cummings.
Akron, N. Y., November, 1906.

The failure of Hotel Bixby at Long Beach, Colo., was due to the removal of the forms before the cement had hardened, is the report of the coroner's jury. The structure was reinforced concrete.

JEFFREY MANUFACTURING CO., COLUMBUS, O.

Catalogue No. 31, seventy pages, illustrating and describing the Jeffrey swing hammer pulverizers and crushing machinery, of which numerous installations are shown. Direct connection with electric motors and belt driven coal crushers and pulverizers. Rock and shale crushers and pulverizers with mechanical air separation. Jeffrey revolving hexagon panel and cylindrical screens. Elevating, conveying, and power transmitting machinery, including rubber belt conveyers, open steel trough conveyers, wire rope and chain conveyers, elevator buckets, concrete mixers, side dump cars, hand and power rock drills, electric locomotives for mine and industrial haulage.

COLORED SAND FOR CONCRETE.

Colored concrete has been produced for years by simply mixing the desired coloring matter with the dry cement powder. This answers very well for ordinary work, yet unless the sand or finely crushed stone is originally of the same color as the colored cement, it will present an artificial appearance and therefore detract from its value. Now comes the Colored Concrete Sand Company of Minneapolis, Minn., with an entirely new product in the form of an artificially colored sand. That is to say each grain of sand is coated with a durable color, which, when used for facing concrete, produces beautiful tints that entirely remove the artificial appearance of ordinary concrete, plain or colored. By the use of this colored sand a much higher grade product is obtained. Where the ordinary cement brick sells from $8 to $10 per thousand the colored sand brick brings from $15 to $20 or more per thousand. This colored sand does not decrease the strength of the concrete. The company now produces sand in two colors, yellow and buff, which they are placing upon the market at $1 per bag. Such a bag will be sufficient to make up several hundred colored brick when used for facing only. It can likewise be used for facing concrete blocks. These sample bags of colored sand are placed on sale to satisfy the consumer that the goods are reliable and to enable the consumer to pass upon the merits of the process after a thorough trial of the same. The sand or the coloring matter will be placed on sale with full directions for preparing the sand. The entire formula will be sold outright to large consumers for specified territory.

For further information address Colored Concrete Sand Company, 707 Andrus building, Minneapolis, Minn.

A cement drain tile plant will be established at Bancroft, Iowa.

PROPER PLANS NECESSARY FOR REINFORCED CONCRETE STRUCTURES.

To the Editor:

The failure of reinforced concrete construction in the new Hotel Bixby, at Long Beach, Cal., by which a dozen men lost their lives and a score more were injured, causes serious thought. Unexplained, it becomes to the casual reader an unanswerable indictment of reinforced concrete, if not of all concrete construction. The erroneous impression should not be allowed to grow. Obviously, if one concrete structure is a success, all will be if built in precisely the same way and of equally good materials. Thousands of such structures scattered throughout the country speak conclusively for themselves.

The trend of public favor toward concrete is shown by the increase of the Portland cement production of the United States from 200,000 barrels in 1880 to 35,000,000 in 1905 and about 45,000,000 in 1906. Its superior fireproof character, greater durability, and less cost, and the advance in the price of lumber and skilled labor, are factors which will cause the demand for concrete to continue its enormous growth. But the interest of the public and of concrete itself demands plain discussion of such failures that their recurrence may be avoided.

Most of the various "systems" use individual steel bars or pieces—plain, twisted, corrugated, or sheared—imbedded in the concrete for its reinforcement. If through false economy or ignorance insufficient steel for the load is used or if the steel is put in faultily so as to leave one weak spot failure is certain. This makes necessary the presence constantly of a careful and thorough expert. It is impossible to find enough experts to man the multitude of big and little concrete structures now building. Consequently foolish economy puts much work in the care of novices, and with inefficient or careless inspection by public officials it sometimes results in accident.

Concrete construction must be reduced to the same mathematical basis as steel and brick construction, with concrete-steel engineers or architects to prepare plans and specifications which any builder can read and follow without deviation, and thus obtain the infallible results in every detail desired and figured out in advance, by the trained expert. The reinforcing members cannot safely be left to be laid in the concrete in separate pieces in a haphazard manner by unsupervised and unskilled hands. These steel bars and rods should be fabricated together into structural units, as in steel and brick construction, with sizes according to the load carefully figured out, so that with the least possible amount of metal a sufficient and uniform strength will be insured at every point throughout the entire structure. The engineer or architect doing this must have his draftsman prepare one set of blue prints to guide the shop which fabricates the steel pieces into the designed reinforcing members and another set for the builder, showing these various members suitably numbered, so they can be quickly set in their precise positions with relation to one another in the building, ready to be imbedded in concrete, without the constant supervision of a trained expert. When the building is completed the steel therein is all tied together and each piece related to the others as scientifically as in a steel and brick structure, and thirty stories can be built as easily and safely as one story. It will be superior, because the steel reinforces the concrete and the concrete reinforces the steel and protects it absolutely against the ravages of time.

The only other method of concrete construction which seems suited to insure absolute safety and certainty is to form the ordinary wet concrete into bricks and blocks of desired sizes and shapes, with heavy automatic machinery, and when set or hardened and thoroughly tested, lay them up in the usual way.

This does away with expensive forms and delays incident to hardening of the walls, and insures a more beautiful, uniform, and impervious structure at much less cost.

It also obviates the danger from an occasional barrel of bad cement, which, if it does not harden, as sometimes occurs, may cause the concrete to fail under the load or when the forms are finally removed, thereby allowing the entire structure to collapse with loss of life and property.

Alfred O. Crozier.

Little Falls, N. Y.
Nov. 12, 1906.

JAPANESE CEMENT INDUSTRY.

Nine years ago Japan's exports of cement amounted only to $8,000 in value, but in 1903 it had increased to $295,000. The war temporarily checked the growth of the industry, the restoration of peace revived it. Not only is the demand for Japanese cement springing up in Corea and Manchuria, but large orders received from San Francisco, brought about by the recent catastrophe, gave a great impetus to it. All the stock in the market has been cleared and the manufacturers are busily engaged in trying to meet requirements. The amount exported in 1896 was 3,096,858 pounds, valued at $12,686; in 1905, 42,149,249 pounds, valued at $197,696.

Up to the end of May this year the value of cement exported had reached over $211,500, while the figures for the corresponding period of the two preceding years were $99,000 and $108,500, respectively. That is to say, the quantity exported during the first five months of this year exceeded that for the whole of last year. The principal countries to which cement was exported during the whole of 1905 and the first four months of this year are as follows, the figures representing tons of 2,000 pounds.

Country.	1905.	1906.
Corea	8,594	3,215
America	199	4,952
China	3,194	1,528
Manchuria	..	1,155
Dutch India	212	327
Russia	..	252
Philippines	2,589	200
Hongkong	678	60
Straits Settlements	40	37
Australia	19	19
Canada	5,171	..
Others	66	44

The capital invested amounts to something like $2,500,000. Only one company declared a 10 per cent dividend last year; most of the companies had to be satisfied with 5 per cent or less. Hitherto the situation looked a bit black. A new stage of development seems to have opened up. The best plants use the rotary kilns; others shaft kilns. One plant has been using a mixture of clay and hydrated lime in compounding its raw mix with excellent results, both as to fuel economy, the production of a better grade of cement.

Mr. R. R. Fish, representing the Medusa waterproofing compound, manufactured by the Sandusky Portland Cement Company, Sandusky, O., dropped into the office of the Cement and Engineering News and gave a demonstration of the superior merits of the Medusa compound. The dry compound will float on water. A lead pencil thrust into the layer floating on the tumbler of water will cause the compound to cling to and envelop the pencil as it descends to the bottom, insulating it from all contact with the water. When the pencil is withdrawn the Medusa compound falls back and resumes its place as a floating layer in the glass, the pencil and the compound remaining perfectly dry. Samples of hardened concrete which had been treated with the Medusa compound rejected water perfectly. Mr. Fish has been making many sales of this compound throughout the country during the past season. We understand that there is a constantly increasing demand for this product, and it certainly deserves success upon its merits.

HIGH GRADE CEMENT PRODUCTS.

Mr. Jules Ruoff, a practical cement expert, is introducing high grade concrete products into this country, together with molds, forms and materials for their production. This work consists of ornamental pedestals for statuary, Figs. 1 and 2.; rosettes, Fig. 3; window frame, top and sills, ornamental pedestals for floor, vases and gate posts, Fig. 4. All to be cast or molded in concrete with high grade finish to represent marble, stone and granite, Fig. 5. This class of work has come into extensive use in Europe. It can be produced at low cost compared with natural stone, and will receive an equally high polish where the proper formulas are used, in each particular style, color or finish. Mr. Ruoff is familiar with the best and latest practice as carried on in Europe to-day, in the production of machine and hand-pressed floor and wall tiles made in various colored cement, and is prepared to execute orders for this class of work, or furnish reliable formulas to those who wish to engage in this class of work on their own account.

Figs. 1 and 2. Concrete Pedestals, Granite Finish.

The formula or material for the manufacture of jointless plastic floorings No. 1 (Cook). This material makes a jointless floor. Can be laid in various colors, suitable for offices, bed rooms. No. 2. Jointless wood flooring laid on as a mortar, suitable for heavy traffic, such as work shops, restaurants, public halls. Can be laid in various colors.

No. 3. Ashes compound flooring for factories, very hard yet light, resist oil and grease, suitable for mills or factories. Can be laid on old floors.

No. 4. Factory Flooring No. 2. High grade factory flooring, for storage warehouses for rough usage, possesses high compressive strength.

No. 5. Insulating Linoleum. Used as sub layer. Elastic, sound proof. One-quarter-inch layer does the work. Used as a base for No. 1 linoleum compound.

No. 6. Fire and Damp Proof Cork Ceiling Construction. Used as a plaster. A 3 ft. 6 in. span will sustain 4,000 pressure. All of the above compounds are mixed and applied as a mortar. State rights, county rights or city rights for any of the above named compounds will be granted at reasonable rates. Special instructions will be given to purchasers in the owner's work when desired. There are no fads connected with Mr. Ruoff's products or formulas. Every detail having been reduced to a practical business basis in this country as well as in Europe.

A RAPID PROCESS FOR DISTINGUISHING FAT LIME FROM HYDRAULIC LIME.

It is a matter of considerable interest to be able to distinguish at times rapidly between a lime classed as belonging to the Fat Limes, or the Hydraulic Limes; this distinction being based actually either in the solidification, or in the chemical composition, and which require processes that take more or less time, and which are inapplicable in certain cases, especially when these processes are such as require very close and careful examination. M. Leduc of Paris has worked out a method in which it will be possible to use sweetened water in this test, and thereby distinguishing between the two varieties of lime. In effect, if a solution of sugar is made to work upon a lime, there is formed, as is well known, a soluble sugar of lime; consequently, it is evident that when a lime properly so-called (CaO) exists in a stone, a greater quantity of acid will be necessary to saturate the lime in equal quantities. M. Leduc pointed out that the hydraulic products throw down much more lime when they are less hydraulic. The author of the said note has made several experiments upon a great number of limes, which experiments and their results have been classified in a table in which all the hydraulic limes containing less than 40 per cent of lime (CaO) have been determined by the following process:

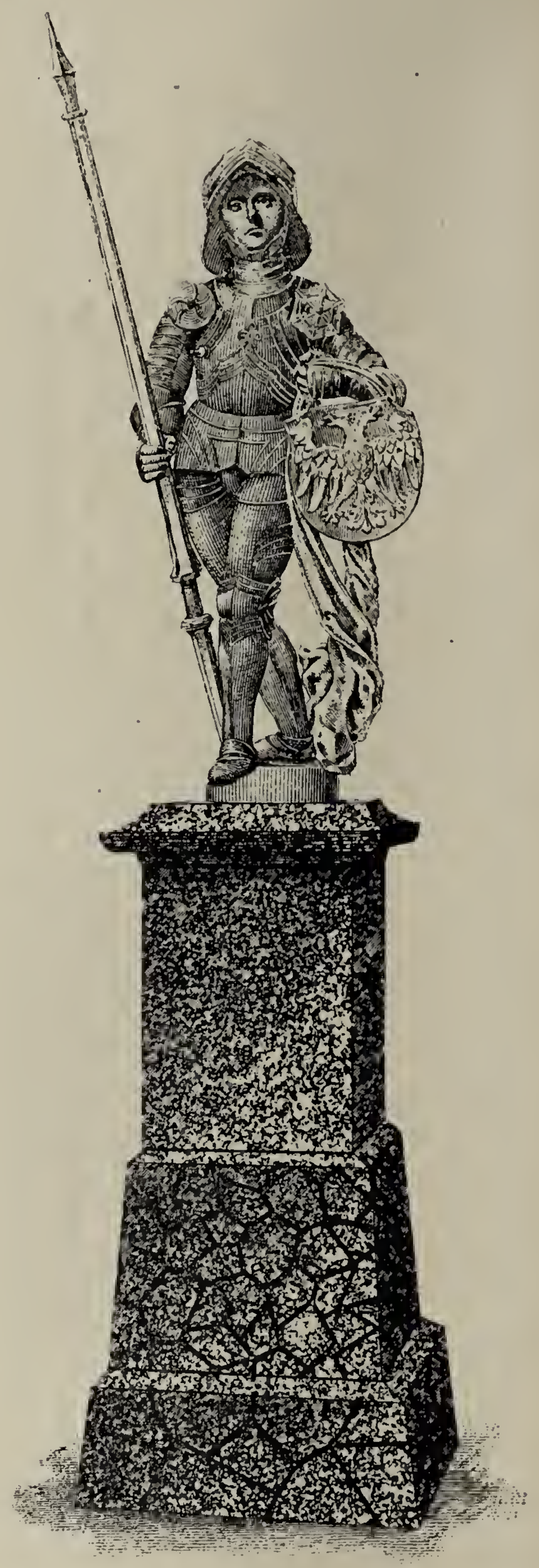

Fig. 2. Swinging Templet for Round Moulding.

One gramme (15 grains) of the material to be tested is first weighed out, and then placed in a small nickel holder, the whole of the material being saturated with two or three cubic centimeters of water sweetened with 10 per cent of sugar; this is tipped into a vessel holding 100 cubic centimeters,

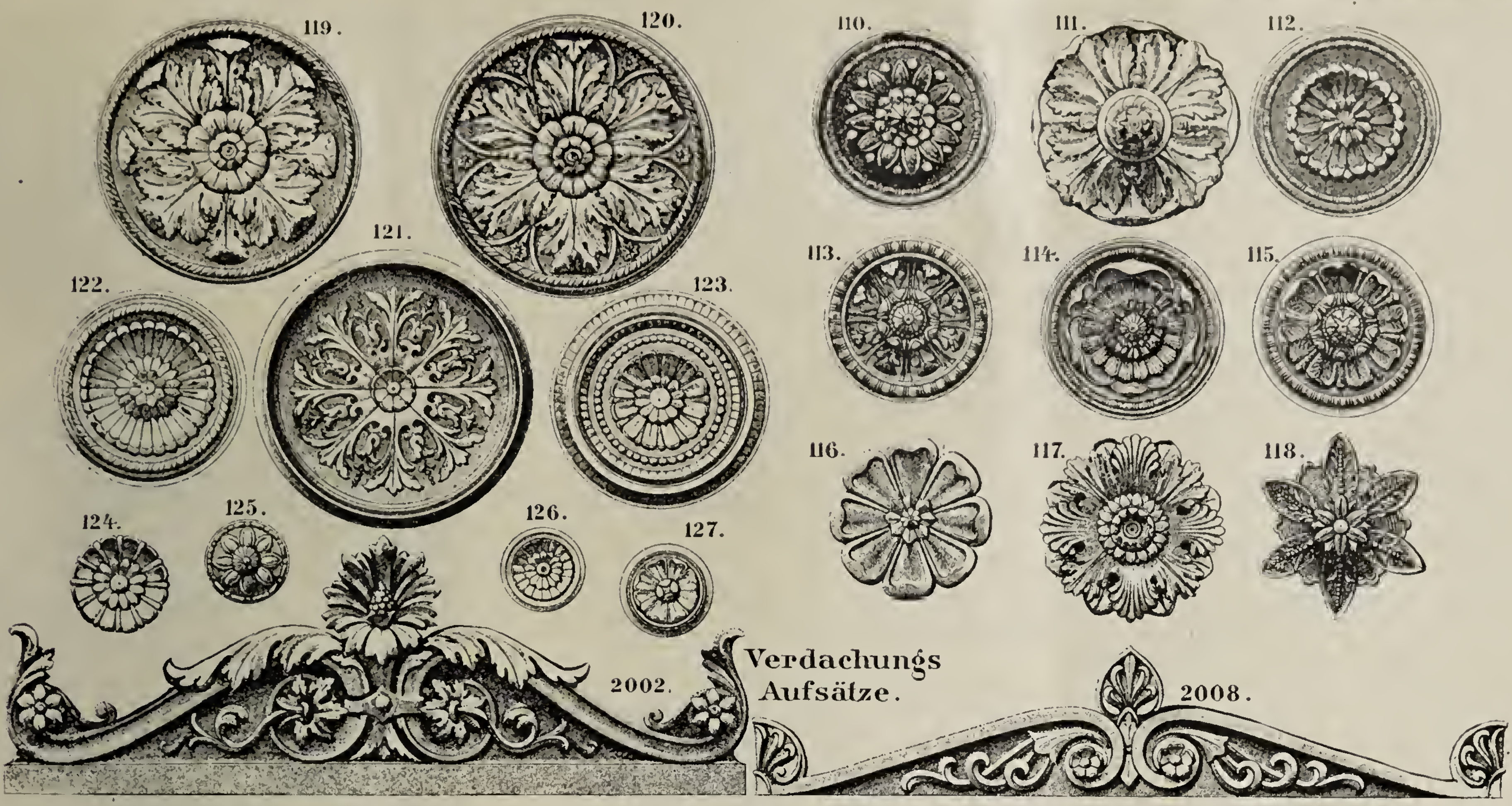

Fig. 3. Rosette Patterns, Cast in Concrete.

and water added until the vessel is filled according to the index at the side, the whole being agitated for exactly fifteen minutes. After this the material is again tipped into a large filter, and the liquid left until it reaches the Index A in the adjoining small apparatus. There now remains a solution which contains exactly 3.57 grammes of sulphuric acid (SO_3) per litre, or 4.373 grammes of liquid sulphuric acid (H_2SO_4). If this remaining solution reaches the Index B, add a few drops of the tincture of Litmus and shake well. If the liquid remains red, it is because it contains more than 40 per cent of lime (CaO); if, on the contrary, the solution turns blue, the operation indicates that the lime has not been thoroughly saturated. In the first case, the lime under treatment may be considered as hydraulic; in the second place, as fat lime.

It may be pointed out here that it is quite possible to employ this method in order to classify the different cements especially when these cements are introduced under the designation of hydraulic or fat, or even when without classification. If one works by this method upon a Portland cement, it must be borne in mind that according to the hydration of the silicates and aluminates of lime, the proportion of lime dissolved does not exceed 5 per cent. It must also be remembered that for cement the cavity B does not contain more than 5 cubic centimetres.

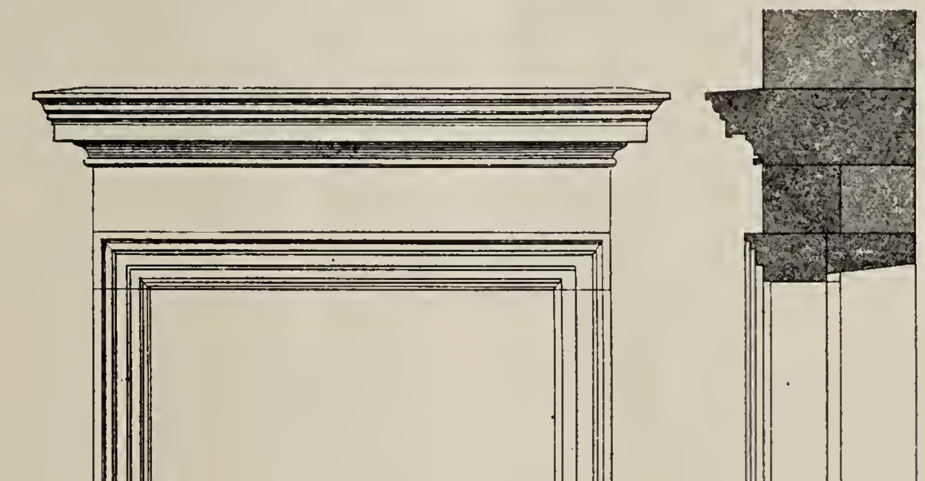

Fig. 4. Concrete Window Frame.

The Lime Manufacturers' Association of Ohio and Indiana, which met in convention at Toledo November 19, complain that the time honored business of lime burning is on the wane. Cement and hard plaster are displacing lime. While lime is coming into use as a fertilizer in some parts of the country, it does not make up the loss caused by the use of cement. The entire situation is discouraging.

COMPOSITION OF PORTLAND CEMENT.

Doctors Day and Shepherd, of the Geophysical Laboratory of the Carnegie Institute, have overthrown completely the existing theories concerning the composition of Portland cement by a paper[1] read before the American Chemical Society last June. Le Chatelier, Michaelis, Newberry, Richardson, and numerous other investigators have all come to the conclusion that tricalcium silicate $3CaO.SiO_2$, is the essential element in Portland cement clinker. Drs. Day and Shepherd by applying to the synthetic silicates the research methods of physical chemistry have come to the conclusion that no such compound as tricalcium silicate exists and conclude that what various investigators have termed tricalcium silicate is merely a solid solution of lime in calcium orthosilicate, Ca_2SiO_4. The part of their paper dealing with this supposed compound is as follows:

The Tricalcium Silicate,[2] *$3CaO,SiO_2$.*—This silicate owes its supposed existence mainly to those investigators who have found it necessary to postulate such a compound in order to explain the constitution of Portland cement. So far as the literature shows, no one has ever isolated and described a pure and homogeneous compound of this composition or defended its properties.[3]. Many and varied attempts to make it have uniformly resulted in mixtures in which poor optical properties have made the conclusions insufficiently positive.[4]

We began the investigation of this composition by fusing the components in the proper proportions and examining the fused product microscopically as others had done. Most previous investigators, however, appear to have depended for microscopic evidence upon the ordinary optical figures and interference colors. Now, it so happens that this mixture when fused crystallizes in an extremely fine structure in which the interference colors are quite different from those of the orthosilicate to be sure, but this is merely the result of the fine state of division and the overlapping of the crystals, and not to another compound. If one examines any of the compositions in which the tricalcium silicate might be expected to figure, using the very sensitive index of refraction as a test of homogeneity, he will find that in every preparation containing more lime than 65 per cent (orthosilicate composition), there is an excess of free lime which can be positively identified. We have fused the tricalcium silicate composition, cooled it rapidly and slowly in various ways without once failing to find free lime present in quantity. Through the kindness of Dr. Clifford Richardson, we were also given an opportunity to examine some of the tricalcium silicate prepared and described by him, and while its ordinary appearance under the miscroscope differed from that of the orthosilicate, a study of the index of refraction showed the supposed tricalcium silicate to be a mixture of the orthosilicate with free lime. Having failed to obtain a single tricalcium silicate which did not contain free lime, and because every specimen which we examined, including many which had been prepared by others, also showed the orthosilicate to be present, we were forced to conclude that the tricalcium silicate has no real existence. We also tried fusing the tricalcium silicate composition with a flux, but the product was always the orthosilicate of calcium.—The Chemical Engineer.

FORMS FOR O. G. MOULDING.

Fig. 1 shows a device for making pattern pieces for making straight O. G. moulding. It consists of a base or moulding board with a flange on one side, which carries the sliding form in the shape of an exaggerated letter I. The center piece "E" is removable. In order that the two sides "a" and "b" may be brought together, or spaced wider apart, the rod "f" carries two clamps shown removed in "m," which seem to hold the pattern mould in place, which is made of a thin plate of steel. The contour of the pattern to be copied is cut into the plate. The moulding which is to be formed may be done in clay or plaster paris, which is placed on the mould board. The pattern and its frame is pushed along the mould board through the material. This shapes the clay or plaster into the desired form. The clay is then covered by plaster paris, which is permitted to harden, thus forming the mould in plaster, which is used to produce the moulding desired either in concrete or plaster.

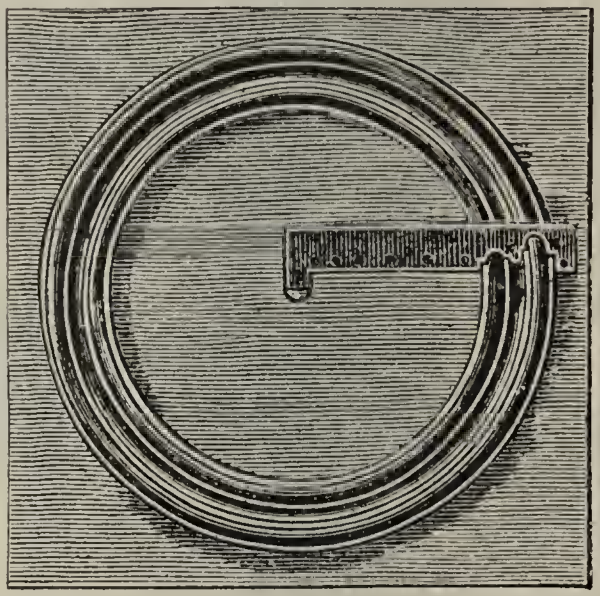

Fig. 2. Circular Moulding Device.

Fig. 2 is a device for making the circular moulding. It is simply a flat level surface, usually of wood, with a small hole in the center. Fig. 3 is used to strike or form the ring moulding. It has a small round bar at one end and the shape or contour of the moulding to be produced. The round bar is set into the hole in the moulding board. The material to form the ring is placed in position and the striking off piece or templet is swung around the circle giving the required form to the material on the board, which is treated as in the case of making the straight moulding before described.

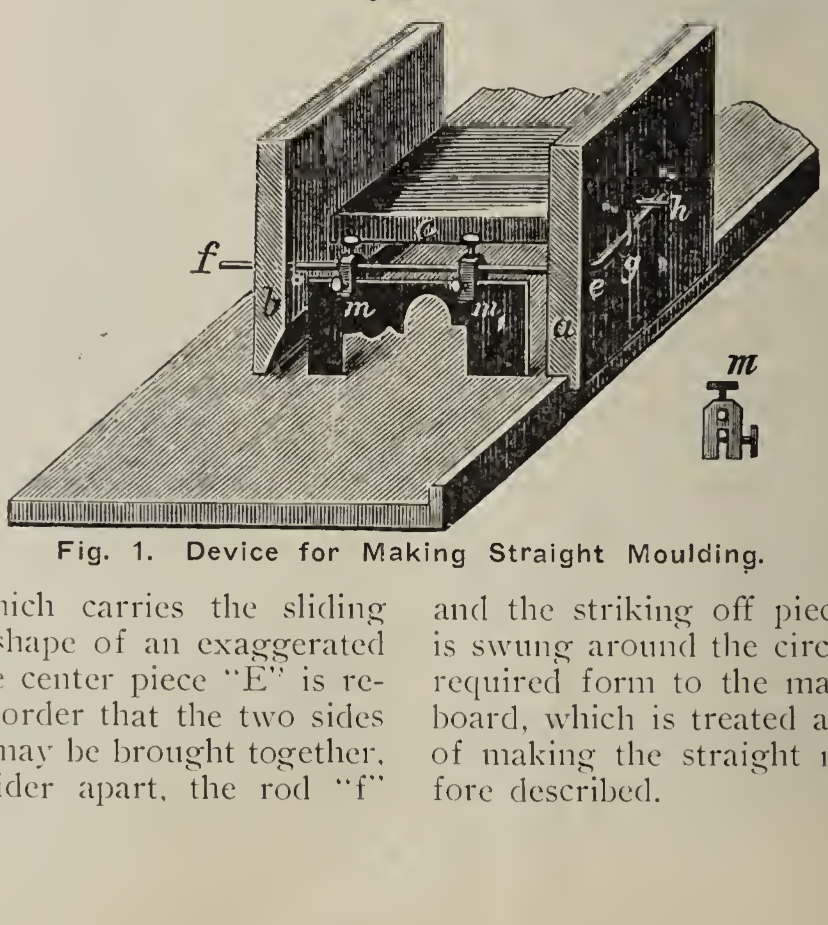

Fig. 1. Device for Making Straight Moulding.

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[1] "The Lime Silica Series of Minerals," by Arthur L. Day and E. S. Shepherd, Journal of the American Chemical Society, September, 1906

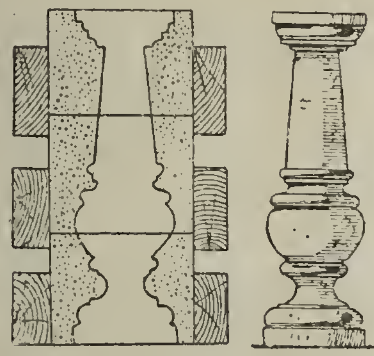
[2] In the literature of the cement industry the hypothetical compound, $3CaO,SiO_2$, is almost universally referred to as the "tricalcic silicate." The substitution of "tricalcium silicate" in conformity with common chemical usage will of course cause no confusion.

[3] It is sometimes described as "nearly homogeneous."

[4] A moment's consideration should suggest that there is no real necessity for assuming the existence of the tricalcium silicate in order to explain the nature of Portland cement. It is a system of at least three components with a great number of possibilities. The real difficulty appears to have been that crystallized lime is relatively inert and does not readily give the reactions common to ordinary lime, consequently the tests which were thought to demonstrate the absence of free lime in these preparations have proved very misleading. For example, we have found that crystals of lime are but very slowly attacked by water (see p. 1094). Another argument which is freely offered—that there can be no free lime present "because if free lime is added the cement dusts spontaneously," is obvious fallacy. Free lime does not cause the dusting, and if it did the fact that the addition of free lime caused dusting would be no proof that none was present.

FORMS FOR CASTING CONCRETE.

Gypsum is extensively used for casting concrete forms and ornamental work, such as statuary, newel posts, rosettes. Statuary in original designs is usually first built up in clay, from which a cast is taken in plaster paris. The preparation of these forms call for special care, skill and experience. They are assembled piece by piece in such a way that they can be withdrawn without injuring the work. The two figures shown, one the many-pieced mould, and the other cast made from the mold, give a good idea of how intricate the mold is required to be to draw well and with safety. The newel post mold is likewise formed of plaster paris, divided into six pieces. The plaster paris is treated with several coats of shellac to make it impervious to water. Hundreds of casts can be taken from such a form. The illustrations and data are reproduced from Beton & Eisen Almanac for 1907.



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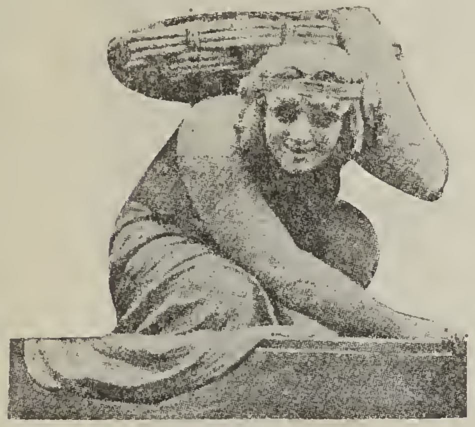

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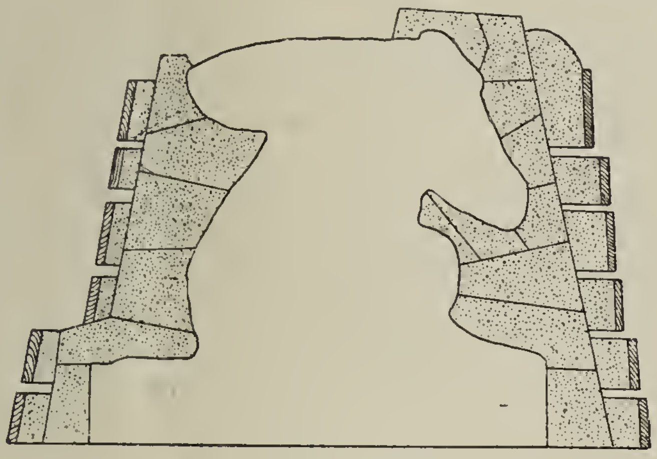


Abb. 9a.

Forms for Casting Statuary and Posts.

Cement Engineering News,
Chicago, Ill.

Gentlemen:

Preliminary meeting of the Northwestern Cement Products Association was held in Minneapolis, Nicollet Hotel, 2:30 Saturday afternoon, November 24th, to arrange details, time of meeting, etc., for their annual convention.

Time set, January 16th-17th, 1907.

Convention and exhibits to be held and shown in the New $300,000 Auditorium at St. Paul. The largest building of its kind west of Chicago.

Convention extends a hearty invitation to all architects to submit wash drawings, photographs, etc., of reinforced concrete buildings, bridges, viaducts, dams, reservoirs, etc., or other work in which concrete is used.

Space reserved for them free of charge to exhibitors.

Architects desiring space reserved should communicate with secretary.

Interest intense in northwest. Greater than every before.

Fully half the space on the exhibit floor spoken for.

The following committee was appointed to wait on Governor Johnson of Minnesota, and Mayor Smith of St. Paul, and invite them to address the convention: J. H. McGuire, Pierce Butler, Phil Herzog, M. T. Roche, Geo. J. Grant, Mr. Mitchell, D. L. Bell.

George A. Hughes resigned secretaryship of the association. Martin T. Roche of St. Paul was unanimously named secretary.

Any information regarding the convention can be obtained by addressing the secretary at 410 Pioneer Press Building, St. Paul, Minnesota.

COMMITTEES.

Publicity—H. A. Rogers, chairman; O. U. Miracle, Martin T. Roche, D. L. Bell, Mr. Corning, Mr. Williams.

Building—Wm. Cameron, Martin T. Roche, chairman; John Wunder, Mr. Remer, Wm. Center.

Business—O. U. Miracle, J. M. Hazen, Mr. Jackson, Lee Stover, Watertown, S. D.; A. H. Laughlin, Lisbon, N. D.: E. E. Dow; John Wunder, Mr. Cobb, Sam Hewson, Mr. Landers, Wm. Stewart, John Wharry, Thos. Manning, J. F. Pearce & Son, D. L. Bell, Martin T. Roche, Thos. Ewing, John Moline, Jas. Meehan, Pitts Bros., J. W. L. Corning, Mr. T. Leahy, H. N. Leighton, F. C. Haglin, Emmet Butler, H. A. Rogers, Mr. Neuman, E. Allard, Joseph Mortan.

Transportation—Harvey B. Smith, chairman; Lee Stover, Watertown, S. D.; A. H. Laughlin, Lisbon, N. D.

Program—O. U. Miracle, chairman; Harvey B. Smith, C. A. P. Turner.

Editor Cement and Engineering News.

Dear Sir:—Can you give any information on a quick setting cement that can be used for stopping leaks in the face of a wall which is to be faced with a layer of concrete mortar. At the present time we are compelled to keep hand pump going for fully 24 hours, to keep the head of water down until the cement sets and takes on sufficient hardness to resist the water pressure.

A sump hole or pit into which the water drains and is pumped out is rather expensive. Is there any cheaper method?

Ans.—Small or even large holes from which water flows in the face of a wall can be stopped in from 10 to 15 minutes by using the following mixture: Sand and gravel 2 parts, Portland cement 1 part. Mix dry. In the water to be used for gaging the mortar dissolve 60 per cent chloride of lime, add this solution to the sand, gravel and cement and fill the holes with the mortar produced. This mixture will set and harden in from 5 to 15 minutes. As the mixture will set in a short time, only sufficient material should be made up that can be used within 3 minutes. Otherwise the mixture will be wasted. You will find fuller details on this subject in the previous issues of The Cement and Engineering News.—

Editor.

ARTESIAN.

The word "Artesian" is discussed and defined by Myron L. Fuller of the U. S. Geological Survey.

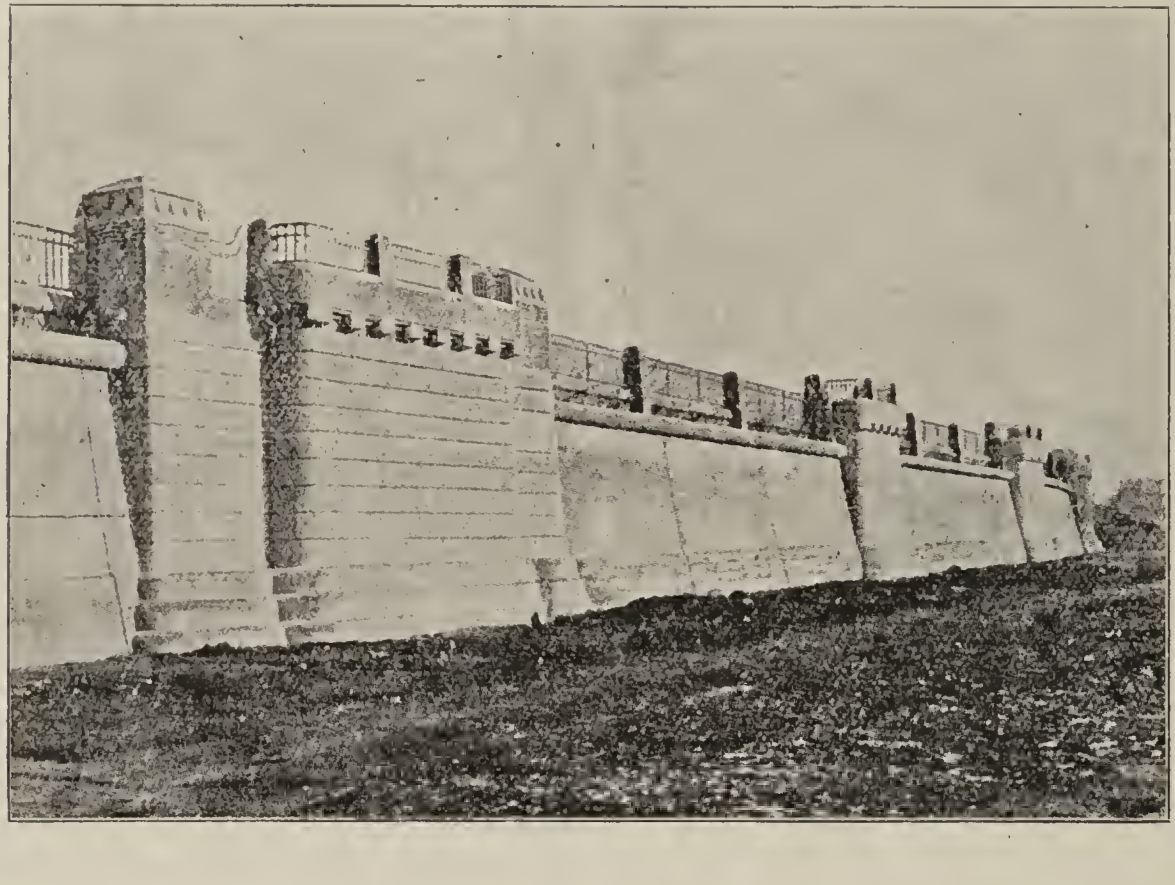
The word artesian takes its name from the town of Artois, France, where flowing wells existed. It means a flowing well under pressure of a head of water higher than the outlet and expressly excludes flowing wells caused by gas pressure.

Bay City, Mich., is involved in numerous lawsuits on account of accidental injuries received on defective wooden sidewalks. Yet wooden walks are constantly being laid even where cement walks are required under the city ordinances, notwithstanding that heavy damages have been paid on judgments for injuries received on wooden walks.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

ORNAMENTAL CONCRETE WALL.

The handsome artistic concrete retaining wall we illustrate was built at Nurnberg, Germany. It is on the water front of the Regnitz river at a point known as Prince Regent beach. This is one of the numerous lantern slide views shown at the last meeting of the Beton Association in Berlin to show the artistic effect that can be produced in concrete at moderate cost.



A CHAMBERED REINFORCED CONCRETE RETAINING WALL.

The reinforced concrete retaining wall shown in Fig. 5 was constructed in Austria, the object being to make it light by means of introducing 7 chambers. The structure has a waterproof face composed overlapping sheets of tin, covered with cement mortar for protection against corrosion. Thin sheet lead covered with an asphalt which comes in rolls like tar roofing paper is used for waterproofing concrete work in Europe and is said to make a perfect watertight work. Yet it is quite expensive.

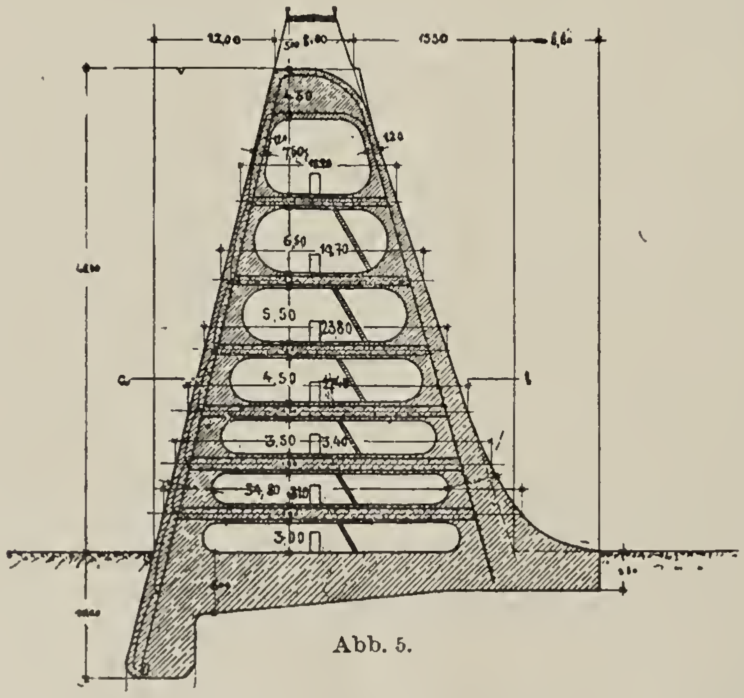


Abb. 5.

GREAT NORTHERN PORTLAND CEMENT CO. RECEIVER.

Judge Swan of the U. S. District Court, on November 22, appointed the Michigan Trust Co. of Grand Rapids receiver for the Great Northern Portland Cement Co., whose works are located at Marlborough, Lake County, Michigan. The company have operated the plant for several years and own the town site of Marlborough and large tracts of land in the county full of marl deposits. The Union Trust Co. of Detroit is trustee under a mortgage for $500,000. The interest falling due on November 1 on this mortgage not being paid, the suit was brought. The plant will be operated by the receiver in 1907. The original cost of the plant was $1,000,000 or over. The company was capitalized at $4,000,000.

MACHINE DRESSED CONCRETE.

The use of machinery for dressing stone has in a great measure displaced hand work, especially for straight work, such as water tables, belt courses. This machine dressed stone has reduced the price of finished stone to such an extent as to bring it down in sharp competition with straight line cast stone work, the superior finish giving the stone the advantage. Why not use machinery for dressing concrete. With the selection of a suitable aggregate the finest effects can be produced. The writer has seen samples of concrete made up with fine sand and sawed into pieces. With an ordinary hand saw. These sawed faces could not be distinguished from natural stone. The sawing can be done before the concrete has fully hardened. This class of work will open up a new field for concrete. The same machinery used for dressing stone can be used on concrete. Concrete can be dressed on a turning lathe as is now done in stone. The Bedford lime stone as well as Louisiana, Misouri lime stone reduced by grinding to a coarse grit answers very well for this class of work.

The time is coming when machinery for finishing concrete will be used. Concrete can likewise be polished either by hand or machinery. Ordinary concrete will not receive a polish, yet by simply mixing up to 10 per cent of finely powdered clay with the cement and uniformly compounding it with the cement before it is mixed with the aggregates, will enable the concrete to receive a high polish, provided the mixture is made rather wet. The mixture must be thoroughly turned over before and after the water is added. The wet mixture producing a more dense stone. There are certain waterproofing compounds now on the market that produce a concrete that can be polished without the use of clay. The writer has seen samples that possessed the appearance and luster of the fine high grade porcelain and of equal density. This surface can be obtained either by casting on glass or on a rubbing bed. Casting on glass, however, results in numerous small air holes unless the greatest care is taken to free the face on the glass from air.

The city of Detroit has passed an ordinance for laying sidewalks on 107 different streets, in either cement, stone or brick, the lot owners having been given up to October 19 to let their own work by private contracts. Most of the work will be carried over for next season.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

COMBINATION SILL, STEP, LINTEL AND STEP MOULD.

The Cement Machinery Co. of Jackson, Mich., have placed upon the market a new adjustable mould for the manufacture of concrete cap, sills, lintels and steps. The mould can be adjusted to produce any of the above named articles from 1 inch to 6 feet in length and from 3 inches to 14 inches in width, and is made in two sizes only, one 7⅞ inches high, and the other 9 inches high, all other dimensions being the same. The bottom of the mould is graduated in inches both as to length and width by sliding the side or end of the mould along the graduated scale to the point desired and the form is ready to mould the concrete into shape. Printed descriptive matter can be had on request from the company.

PROPOSALS FOR WATER SUPPLY.

The Board of Public Works of the city of Elkhart, Ind., are asking for bids for supplying the city with water for the period of 25 years, the contractor to erect and operate the plant. Each bid must state the price to be charged said city for water furnished for public use and to private consumers, and the conditions under which water mains will be extended. Work to commence within six months after signing of contract. About 30 miles of water mains and 300 fire hydrants are now in use. Bids will close at 10 a. m. on Jan. 10th, 1907.

SPECIFICATIONS FOR WIRE GLASS AND METAL FRAMES.*

Wire Glass—The mesh in the wire glass not to exceed ⅞ inch, the wire not to be smaller than No. 24 Brown and Sharp gage, the wire reinforcing to be practically midway between the two glass surfaces. Hollow metallic window frames containing the sash or glass not to exceed 5 by 9 feet. The metal frames containing the sash or glass to be reinforced by I-beams and thoroughly protected by approved fireproofing. I-beams to be securely fastened into the masonry, proper allowance being made for expansion of beams when heated. In new buildings the reinforcing member should be installed as the building is erected. The depth of the I-beam to be less than 5 inches and deeper beams being required for spans greater than 9 feet. The I-beam to be protected by at least 2 inches of tile concrete or other approved fireproof material. The thickness of the fireproofing to be increased on larger I-beams, the reinforcing member to be enclosed in the metal frame and riveted to the frame. Purely ornamental iron parts may be fastened by soldering.

CEMENT FOR PANAMA CANAL.

Estimates originating in Washington on the quantity of cement to be used in the construction of the Panama Canal place the figure at 9,125,000 barrels, and that little cement will be used in the next two years, as the state of the work will not be advanced enough before that time to use cement in large quantities. The high prices of cement and the great home demand has led the government to look with favor in purchasing cement abroad. The canal zone being under the jurisdiction of the United States, why should not the tariff of 32 cents per barrel apply on cement? This tariff is primarily designed to protect the American manufacturer.

Practical Lettering. For Beginners, Draftsmen, Engineers and Stone Cutters. By Thomas Meinhardt. 13¾ inches. Price 60 cents. Published by The Norman M. Henley Publishing Co., 132 Nassau St., New York.

This is a practical hand-book of instructions for designing letters used by engineers, architects and other draftsmen after a system invented by the author, each letter being divided into four quarters; each division is again subdivided into four parts or points, making 16 points in each letter, giving 676 possible combinations, based upon a systematic method of spacing. All explained and illustrated by numerous examples, whereby letters may be enlarged or reduced to any desired height, the true shape and form of such letters being preserved. The book is full of useful hints which will be appreciated by the trained expert draftsman or beginner.

Engineering in Small Towns and Cities. By Ernest McCullough, C. E. 485 pages. Price $3.00. Published by the Technical Publishing Co., Chicago, Ill.

This is an eminently practical book on the subject of municipal engineering for small towns and cities. It was primarily designed for the use of public officers who do not possess special engineering training. The work describes the materials used in the construction of public works. Method of work and specifications for practically all public utilities, such as street pavements, sidewalks, curbs and gutters, sewer construction, establishing of grade and bench marks, street cleaning, sewage filtration, plants, etc.

Mr. McCullough's data cover a wide range and in the main are based upon his own experience as a contractor and superintendent of construction. It is one of the cleverest written books that have come under our notice, the language being plain and direct to the point.

The book should be in the hands of all contractors engaged in city work, not only for the clear and accurate description of the entire range of work called for in public improvements, but likewise to understand the position and methods pursued in the city engineering department in preparing plans and specifications for such work.

The book is a treasure house of useful information for such contractors, especially for the young and inexperienced contractor who is reaching out on new lines.

We congratulate Mr. McCullough on his thorough grasp of the subject of municipal contract work. The book is worthy of a wide circulation on its merits.

The Standard Oil Co. builds its pumping stations of concrete blocks.

The Northern Malleable Iron Co. of St. Paul, Minn., is erecting a $135,000 factory building in concrete.

Two hundred and eighty-five men are employed in the construction of the Northwestern States Portland Cement Company's plant at Mason City, Iowa.

Concrete telegraph posts are being manufactured at Richmond, Ind., by the Richmond Home Telephone Company. L. H. Stoner of Albany, Ind., claims this company is infringing on his patent.

The Winona Portland Cement Co. of Selma, Ala., has been organized, with $1,000,000 capital stock in all subscribed. J. P. Weatherbee of Waynesboro, Miss., president; Houston Armstrong of Selma, treasurer.

The Standard Portland Cement Co. of Leeds, Ala., has started up. Ground was broken April 10. F. H. Lewis, general manager; C. M. Goodman of Philadelphia, chemist; Henry Froehling of Richmond, Va., assistant chemist.

The fire at the Nazareth Portland Cement Company's plant on Tuesday, November 13, destroyed two large storage houses, one house containing 20,000 barrels of cement ready for shipment and the other house being empty. Loss estimated at $175,000. Defective electric wiring caused the fire.

The large reinforced concrete chimney which failed at the McKinley power house at Peoria several months ago, will not be rebuilt until next season on account of the danger from freezing during construction. The city inspection department takes this view; on account of which the work has been deferred until next season.

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*Rules and requirements of National Board of Fire Underwriters and National Fire Protective Association.

CIVIL SERVICE EXAMINATIONS.

The U. S. Civil Service Commission will hold examinations for the following questions:

For surveyor in the Philippine service, Dec. 22-28, 1906. Salary, $1,400 per year.

For topographic and cartographic draftsmen in the office of the chief of staff, war department; salary $100. Examination July 9-10, 1907.

For particulars and blank applications address Civil Service Commission, Washington, D. C.

NEW $10,000,000 CEMENT COMPANY.

The North American Portland Cement Company, capital $10,000,000, was incorporated in New Jersey on November 23. The incorporators are J. Rogers Maxwell, Henry Graves, Jr., Alphonse de Navarro, Harry C. Texler, Edward M. Young, Arnold F. Gerstell, John D. Wright, Robert W. Leslie, J. B. Lober and E. R. Ackerman.

Fremont, Nebraska, laid six miles of cement sidewalk during the past season.

S. H. Emerson has been appointed concrete engineer of the Department of Building of Cleveland, Ohio.

The city of Milwaukee has passed an ordinance requiring all sidewalks to be constructed of concrete in the future.

The public parks of Greater New York cost the city nearly $40,000,000. The annual cost of maintenance is over $2,800,000.

The city of New York prohibits the use of short-leaf pine timber. No other but yellow pine grown south of North Carolina can be used for spans exceeding 24 feet for all buildings with stores.

The Modern Concrete Machinery Co. of Terre Haute, Ind., has been incorporated, capital $50,000, to manufacture concrete block machinery under the Bowsher patents; a wet face-down black process being used.

The Dewey Portland Cement Co. has been incorporated at Coffeyville, Kan., capital $2,000,000, to manufacture and deal in Portland cement. The plant is to be erected at Dewey, Ind. Ter. The raw materials are limestone and shale Twenty-five thousand dollars of the capital stock has been paid up. The incorporators are Frank E. Taylor, J. H. Keith, both of Coffeyville, and H. F. Taylor of Dewey, I. T.; Geo. H. Gordon and W. W. Van Winkle of Parkersburg, W. Va.

INCORPORATED.

The Dupont Powder Co. is building a similar town 20 miles south of Denver.

The Iowa Portland Cement Co. has commenced work on its plant at Mason City, Iowa.

Sherburn, Minn., is to have a cement tile factory. Messrs. Keil and Mickelson, proprietors.

A. B. Glaspie, of Oxford, Mich., deputy state factory inspector, is gathering statistics on the cement brick industry in Michigan.

Chuckanut Portland Cement Company of Bellingham, Washington; H. Edwin Moore, of Los Angeles; Clancey M. Lewis and Theodore Maynard, of Bellingham.

Mr. Charles Benfield of Shelbyville, Ind., operating a public weighing scale, has rebuilt the pit walls of concrete, instead of wood. He says this does away with any future repairs.

The Concord Manufacturing Co. of Rome, Ga., capital $100,000, to build and operate cotton and woolen mills, to manufacture corn meal, flour, stock feed and pack cotton, to erect buildings, dams or other structures of cement.

The Mistleote Concrete Company of Fort Worth, Tex., and Oklahoma City, Okla. The capital stock is placed at $30,000. The directors are J. A. Crow and C. M. Crossland of Fort Worth and J. W. Daniel of Oklahoma City.

Narragansett Cement-Stone Manufacturing Association, No. 135 East State street, Trenton, N. J.; to manufacture stone, cement, building materials, etc.; capital, $100,000. Incorporators: J. W. Bond, Providence, R. I.; Melville F. Goodrich, Englewood, N. J.; Martin P. Devlin, Harry R. Wilson, Alis L. Pierson, Trenton, N. J.

The Northwestern States Portland Cement Co. has commenced suit against J. J. Mayne, owner of 200 acres of land near Mason City, Ia., asking the court to compel the owners to make deeds for lands upon which the Northwestern States Cement Company held options. The Lehigh Portland Cement Co. hold options on several parcels of the same land at higher prices.

The American Smelting & Refining Co. is building a new town near Trinidad, Colo. Every building in the place will be of concrete construction. The only wood to be used will go into roofs and inside trimming. The company owns extensive coal mines at the town site. The custom of the miners heretofore has been to live in rough shanties or dug outs in the hills, especially by the foreign workmen. It is the aim of the company to prevent this and compel the workmen to live in the new concrete buildings, which are to cost $500,000.

John C. Olmsted, the noted landscape engineer of Brookline, Mass., in an address before the Real Estate Men's Club of Seattle, on the "Beautification of Seattle," recommended the construction of reinforced concrete bridges in replacing the old pile - and trestle bridges, as the reinforced concrete bridges could be designed with an eye to architectural beauty, as is the practice in the East. He likewise recommended an elevated roadway along the water front for the heavy traffic below and the light traffic above, with hotels and apartment houses opening up on the upper driveway, which would shut out the undesirable view of the heavy triffic, leaving a clear and picturesque view of the beautiful water front.

The copper output for 1906 to date was 1,005,000,000 pounds, while we consumed 720,000,000 pounds during the same period and exported 500,000,000, and our imports of copper were 225,000,000 pounds, making the total copper handled in this country 1,230,000,000 pounds.

The Tradesman of Chattanooga, Tenn., contains an article on "The Cement Resources and Industry of Texas," by Alexander Duessen, instructor in economic geology at the University of Texas.

On account of the scarcity of good gravel the Board of Public Works of Indianapolis has ordered that crushed stone shall hereafter be substituted for gravel in concrete · foundations for street pavements in that city.

The Link Belt Company has recently opened an office at No. 913 Missouri Trust building, St. Louis. E. C. Berghoeffer, an engineer of long experience with the Chicago house of the company, is in charge.

The Detroit River Transit Co. has secured the contract for furnishing the sand required to build the Michigan Central Tunnel under the Detroit River. Nearly 160,000 cubic yards of sand will be required for making the concrete. This sand will be procured at the mouth of the Black River, near Port Huron, by suction pumps.

The Utah Light & Railway Co., owned by E. H. Harriman of New York, has notified the Salt Lake City authorities that it will pave all tracks of the city railway with concrete.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

JAPANESE CEMENT INDUSTRY.

There are twelve Portland cement plants in Japan. The following eight plants have a capital of 4,206,000 yen, equal to about $2,103,000 American money, and a combined output of 940,000 barrels in 1905, as follows:

	Barrels.
Onada P. C. Works	200,000
Assano P. C. Works	200,000
Nippon P. C. Works	90,000
Hikido P. C. Works	200,000
Chino P. C. Works	120,000
Aichi P. C. Works	120,000
Asaka P. C. Works	120,000
Kizkawa P. C. Works	30,000

The following plants are not included in the above, the daily capacity only being given:

	Barrels.
Suzuki P. C. Works	30 to 80
Oushu P. C. Works	200
Saya P. C. Works	200
Atsuta P. C. Works	350

Japan now exports cement to the United States and Canada. During the cement shortage Japanese cement has been shipped as far East as Denver, Colo., via San Francisco. The principal export market is, however, the Philippine islands, China, Korea, Java and Sumatra. The cement exported from Japan in 1897 was valued at $8,000, while in 1903 it increased to $295,000. The Aichi Cement Co. declared a dividend of 10 per cent in 1905. The other cement companies declared only 3½ to 5 per cent. The machinery and kilns used by the Japanese cement plants comes from Germany. The American rotary kiln has been introduced in one or more of the plants.

CEMENT PAVED STREETS.

There is considerable concrete street paving now being done. The entire pavement, including top finish, being concrete. The first work of this kind was at Bellfontaine, Ohio, over ten years ago. Philadelphia has paved a number of its alleys in concrete. Richmond, Indiana, has several all concrete paved roadways. Greenfield, and Greenville, Mississippi, have both laid the same kind of concrete pavements this season.

U. S. MACHINERY EXPORTS.

The export of American machinery for the fiscal year ending June 30, 1906, was valued at $93,448,000 while England exported only $64,836,326 worth of machinery. The largest single item of machinery we exported was agricultural machinery, valued at $24,554,427.

PERFORATING ARMOR PLATE BY GAS JET AND ELECTRICITY.

A new and rapid process for perforating armor plate was recently described in a German engineering journal. The process is substantially as follows: An eight-cell accumulator battery of 400 amperes discharge, one pole being connected with the armor plate, the other pole being connected to a copper tube, which forms the terminal of a flexible hose, the hose being connected to a reservoir of oxygen. The hose is capable of withstanding a pressure of 450 pounds. The battery is then opened and the copper tube brought in contact with the armor plate and withdrawn to form an arc. The oxygen gas is then turned on and flows through the copper tube and is ignited by the arc. The high temperature produced by the oxygen jet which strikes the face of the armor plate under a pressure of 450 pounds, thus eats a hole through the plate as if it were wax. The high temperature, being confined to a small area of the plate, cools rapidly. When the hole has to be tapped or bored, the interior has to be resoftened so as to render the process of any practical use. At present it is used for fusing lost tap holes of blast furnaces.

The American Tobacco Company is erecting several large reinforced concrete buildings at Hartford, Conn. One building, three stories high, 175 feet long by 75 feet wide, will be completed in December. The sorting and packing warehouse is 261 feet long by 61 feet wide and one story high, and is well under way. The roofs of both buildings are reinforced concrete throughout.

The Iowa Central Railway is grading for a new siding to connect its main line with the Northwestern Portland Cement Company's plant at Mason City, Maine.

The Sidney Portland Cement Works at Sidney, Nova Scotia, started up again on November 21. The works shut down on account of shortage of coal supply.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

Hollow Concrete Block Building Construction
By Spencer B. Newberry

Illustrated. Covers in detail. Materials, cement and aggregates. Process of manufacture to obtain the best results. Waterproofing mixtures. Classification of machines. Hand and machine tamping. Crushing strength. Handling and storing. Table of mixtures. Strength with sand and gravel, or limestone screenings. Cost of materials. Fine sand mixtures. Absorption, porosity and permeability. Color mixtures. Estimates, labor and materials. Comparative cost of brick and concrete blocks laid up in walls. Reprohuction of concrete in various patterns, shapes and designs.

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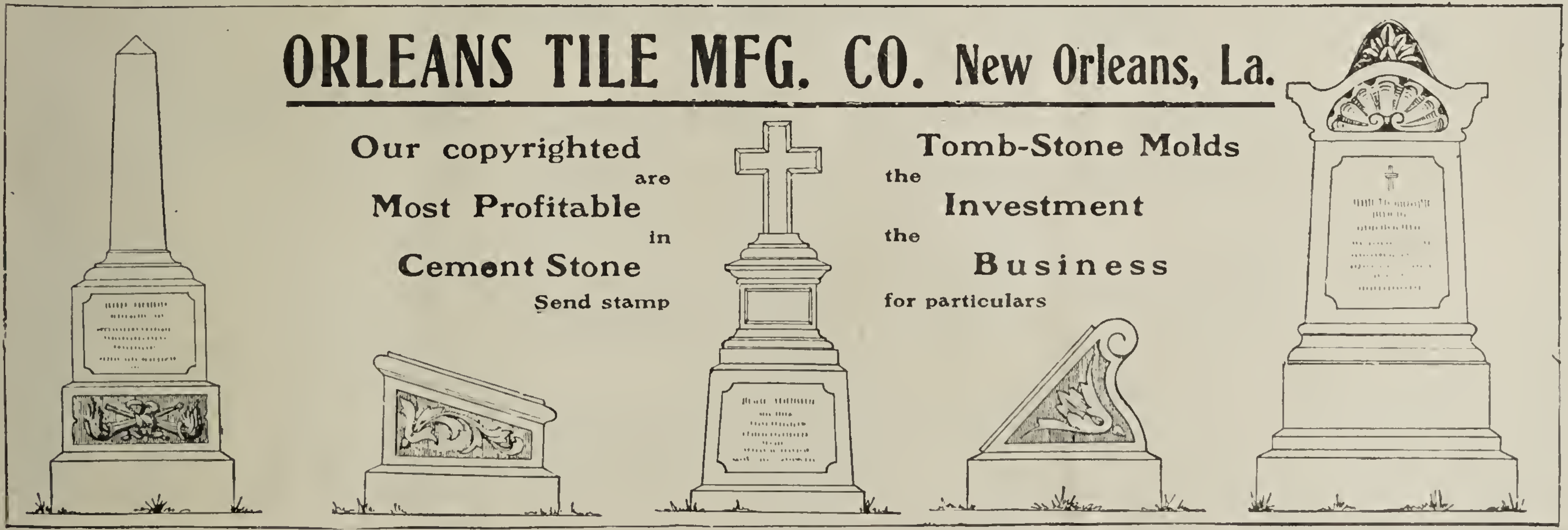
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about 700 acres of Marl. Pronounced by College Chemist to be good for Cement. Near two railway lines and clay. Address, S. W. BARKER, Grand Rapids, Mich.

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Wishing to purchase the State rights of the Stevens patents for cast stone, known as litholite and roman stone, will please address

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Two Mechanical Draftsmen experienced in design of cement plants.

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Position. Chemist, five years' experience, now employed as assistant desires position as head chemist. First-class references.

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somewhere near Chicago to assist us in showing and selling properties. No experience necessary if willing to let us teach you the real estate business. Salary, $60.00 a month to honest man willing to devote part of his time to this business.

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Stockertown, Pa.

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CEMENT BURNER, experienced in wet process. Apply immediately, giving references, stating age, experience, salary wanted, whether married or single, and how soon could come. Address "Cement." care of CEMENT & ENGINEERING NEWS.

POSITION wanted as Superintendent of an artificial stone or hollow block plant. Experience, 9 years in Germany and 5 years in the United States and Canada; understands every particular in that work, dry and wet process, (Stevens.) Competent to take entire charge. First-class references. Address Box C, care of CEMENT AND ENGINEERING NEWS.

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Position wanted as foreman or general foreman. Ten years' experience in construction, operating, and repair work in cement mills. Address, "Reliable" care Cement & Engineering News.

EXPERIENCED cement expert and superintendent with draftsman, electrician, general foreman, department foreman, millwrights, burners, machinists, steam engineers, also chemist and physical tester, desires change, preferably to new company. References if desired. Address Q, care Cement & Engineering News.

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Second-hand Drier in good condition, 4 ft. or 4 ft. 6 diameter, 40 to 50 ft. long. Address "Drier," care of CEMENT AND ENGINEERING NEWS, 22 Fifth Ave., Chicago.

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For cement plant, who is willing to shift for night and day work. Address with references, "General Foreman," care CEMENT AND ENGINEERING NEWS.

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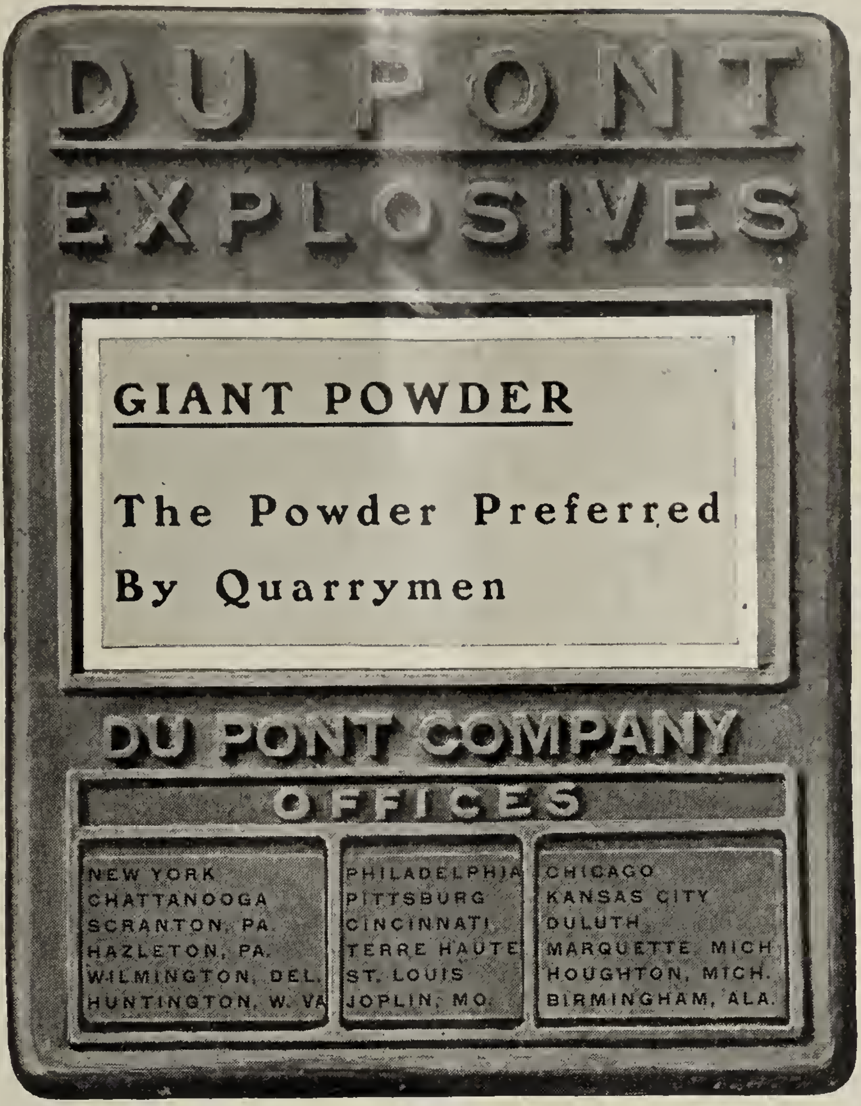

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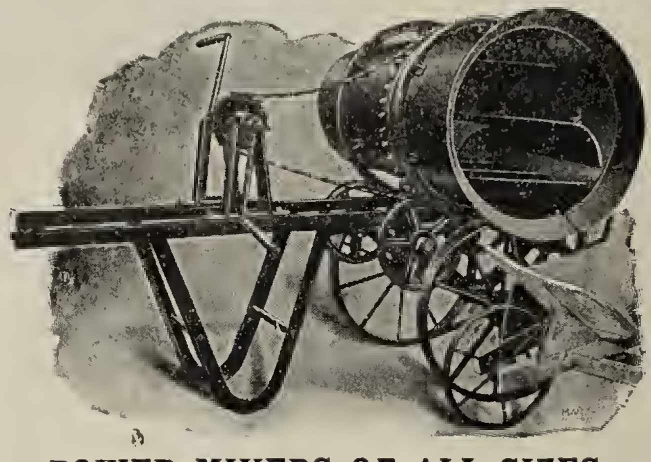

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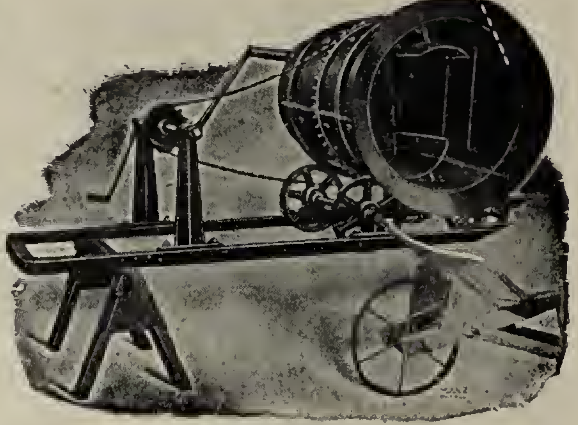

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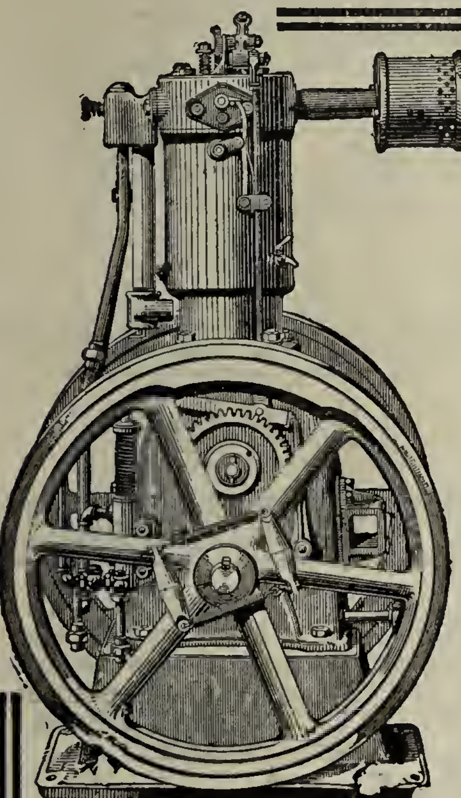

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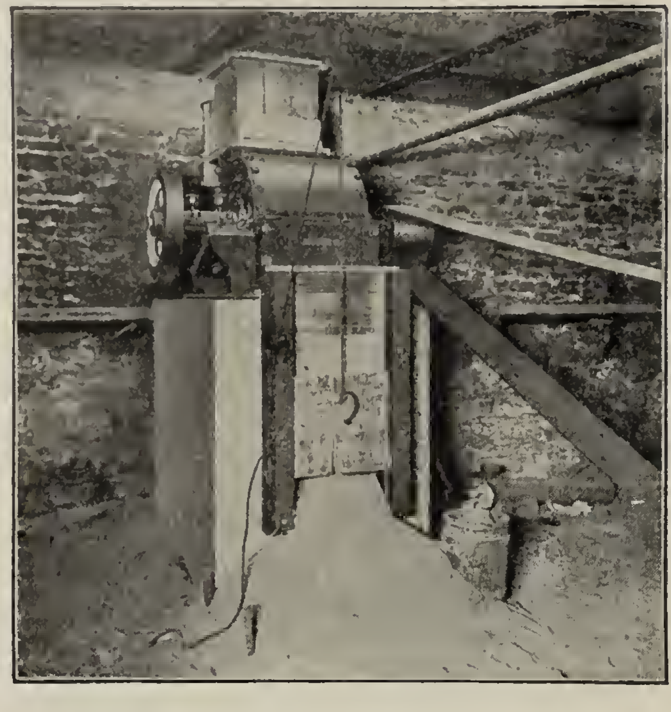

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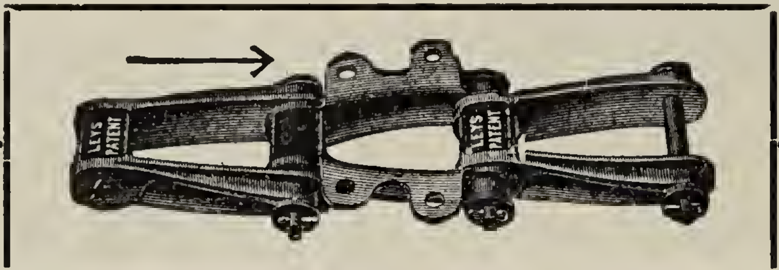

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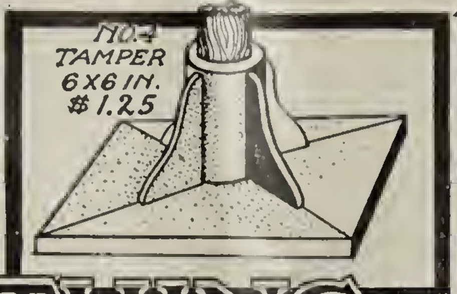

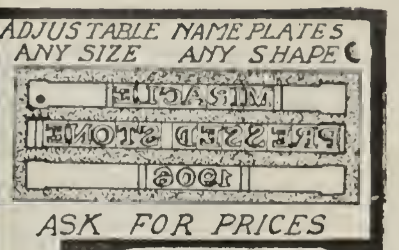

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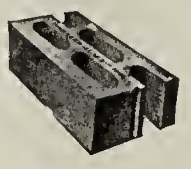

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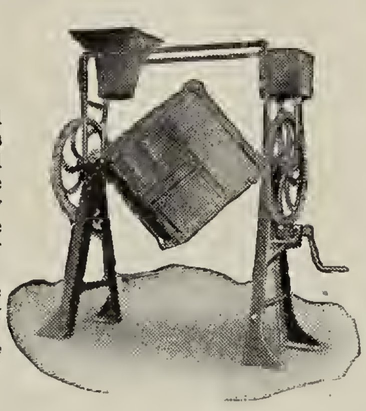

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NO. X5 STRAIGHT END JOINTER
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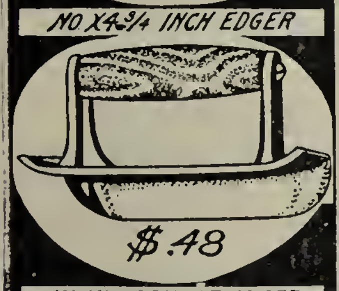

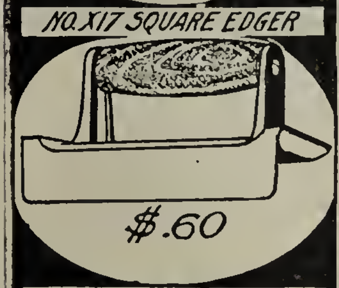

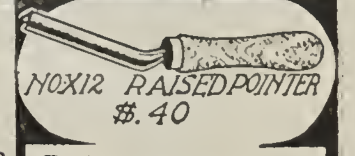

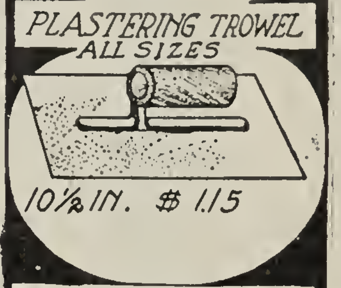

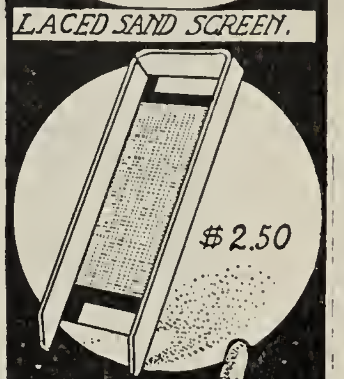

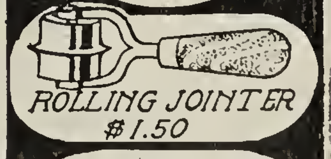

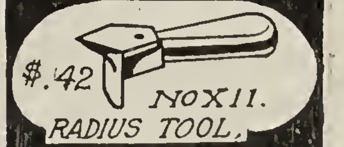
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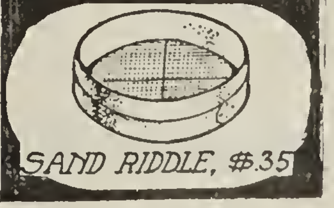

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Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

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For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

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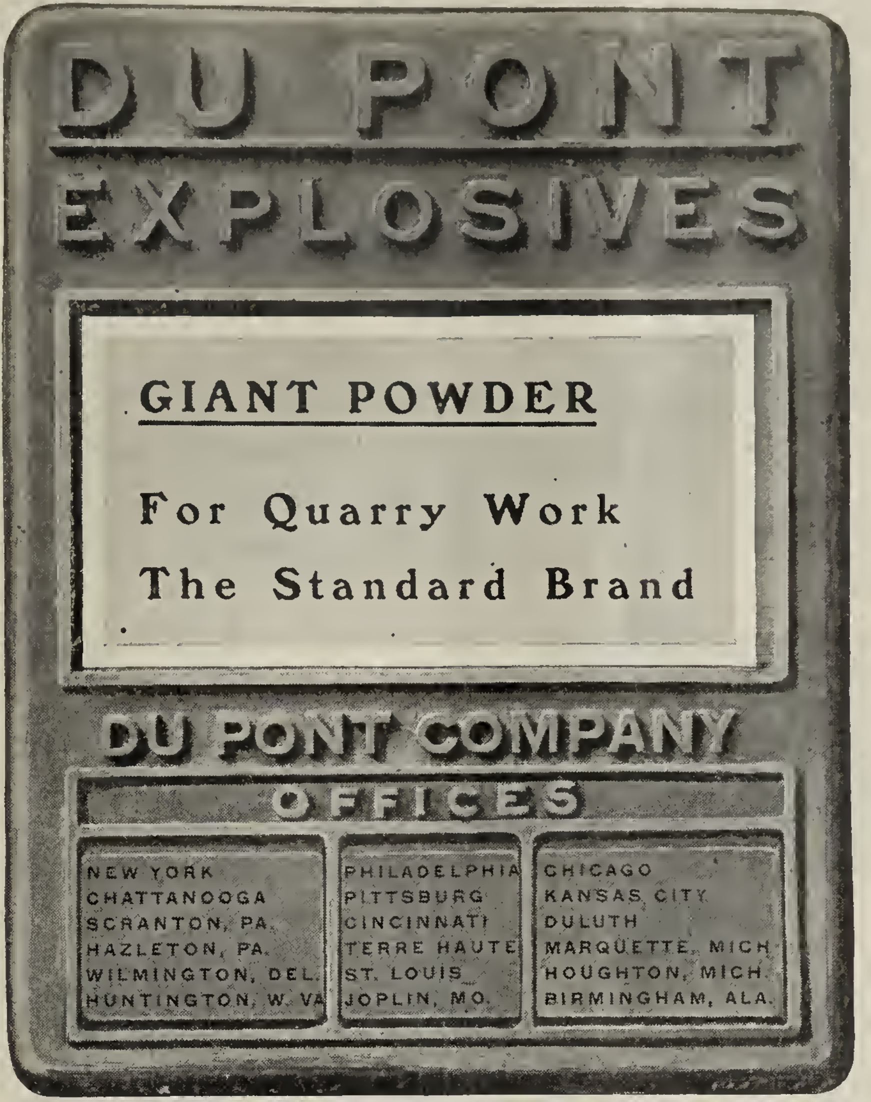

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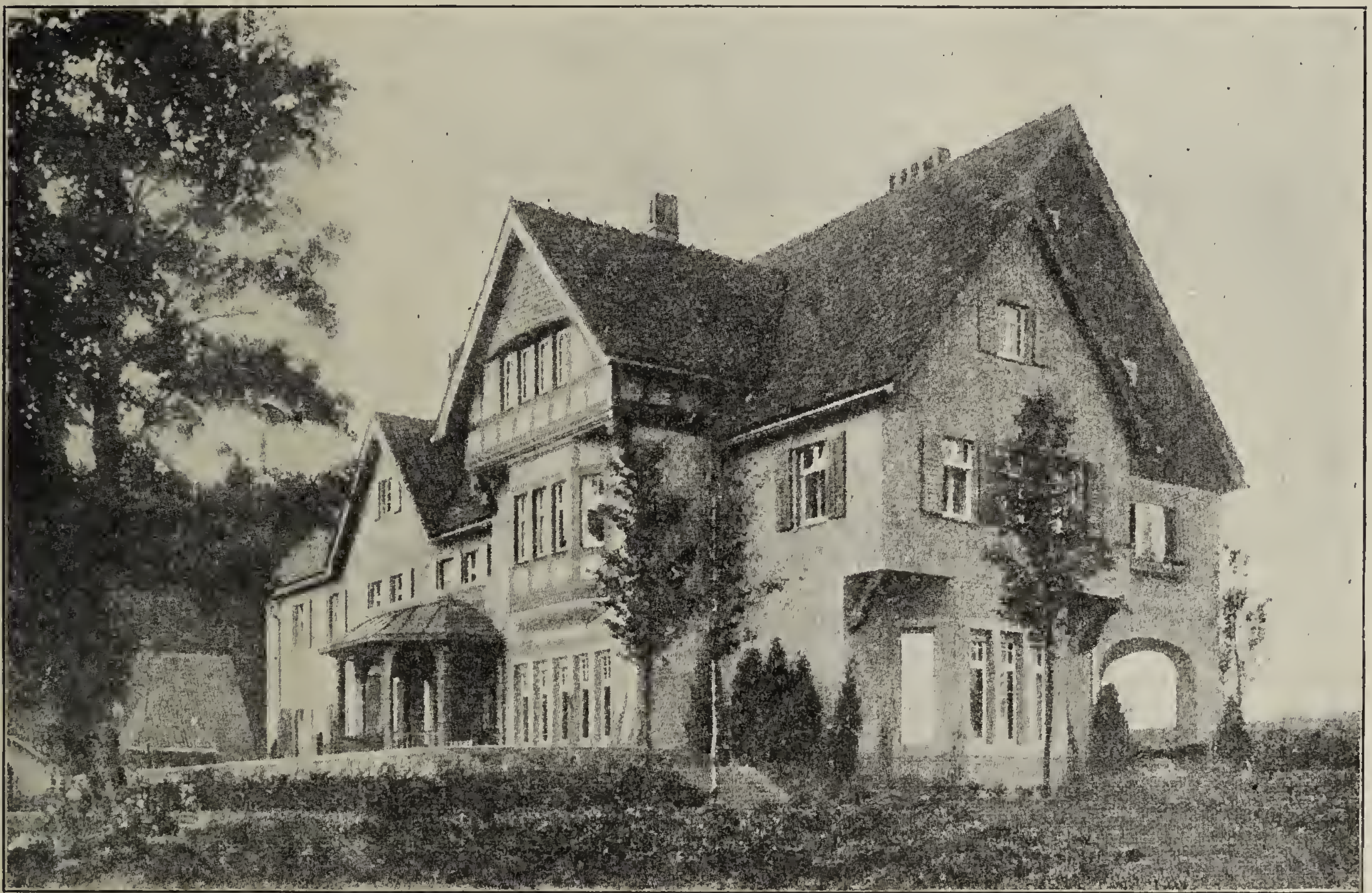

Cement Plastered Villa at Heikendorf, Near Kiel, Germany. Otto Maick, Architect, Charlottenburg.—For Description See Page 298.

CEMENT AND ENGINEERING NEWS
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WILLIAM SEAFERT, Editor and Publisher
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CHICAGO, DECEMBER, 1906.

CORRESPONDENCE.

We solicit correspondence on all matters of general interest to the cement trade in all its branches Engineering notes, public improvements, and facts and opinions drawn from practical experiments will be welcome.

THE PORTLAND CEMENT INDUSTRY IN 1906.

The cement industry in 1906 was unusually prosperous, the demand was fully up to the output during a greater portion of the active season of construction work. The San Francisco earthquake broadened the field of cement construction by lifting it up as the ideal material for building constructions. It swept away the last vestige of a once deep seated prejudice against cement.

True, we still hear now and then that cement is not a reliable building material, but such talk does not come from honest minds, but rather from vested interests and trade rivalry, who find their business contracting and being supplanted by cement. These people find it an up-hill argument to cry down cement.

The mill output of 40,000,000 barrels in 1906 will be exceeded in 1907 by at least 10,000,000 barrels, one manufacturer of cement machinery alone having orders on his books capable of producing 4,000,000 barrels of finished cement in 12 months.

The steel industry is unusually prosperous, the demand for iron and steel being much beyond the capacity of the mills to supply.

This is a healthy sign for another prosperous year in building construction, upon which the cement industry depends for its continued prosperity. One fact that has been little noticed or commented upon is that the Jews are adopting reinforced concrete for their factory buildings. This clear-headed people make few mistakes in their business investments, and their adopting concrete instead of brick and stone to house their industries, shows that they are abreast of the times in modern and safe building construction.

The concrete building block industry has shown a rapid development during the past year. New and improved machinery is being introduced in this line which finds a ready outlet not only in America but in most of the civilized countries of the world. The United States is setting a new pace in every form of concrete machinery.

FAULTY REINFORCED CONCRETE CONSTRUCTION.

The general public are beginning to take notice that concrete can be abused in the hands of incompetent workmen as well as other materials of construction. Incompetency and failure go hand in hand.

It is a remarkable fact that most of the failures in reinforced concrete structures can be traced directly to structures in which deformed bars are used. This is not due to the deformed bars being inferior to the plain bar, but rather to the fact that the deformed bars are more extensively used by new or inexperienced contractors, it being the custom of the companies manufacturing these deformed bars to make sales wherever they can find a customer, for whom the vendors of the deformed bars prepare plans and specifications and will likewise furnish men to superintend the construction of the work the customer may have in hand. The estimates of the cost of the work in hand is often much lower than surrounding conditions will warrant. The contractor, relying upon these estimates, expects to clean up a round sum on the job, but in four cases out of five the contractor will be confronted with a loss on the job. First, because he is inexperienced; second, because his working force has not been reduced to a proper economical basis, which can only be attained by time and experience. In carrying out reinforced conrete construction work in Chicago one system has passed under the control of three different firms, all of whom lost money. We have in our mind's eye a system of deformed bar reinforced concreate construction that has had five failures during the past year, where the buildings collapsed. Two of the leading Chicago railway companies will not permit this particular system to be use on their construction work. We believe these deformed bar vendors should establish schools in which men who are to go out to superintend work should be educated. This is what the great reinforced concrete construction companies in Europe have found to be absolutely necessary in order to avoid failure by reason of faulty construction. It is not the materials of construction that are at fault, but rather the man behind the gun, that insures sound construction.

INCREASING THE BULK OF IRON.

The Franklin Institute of Philadelphia says "Knoledge" has awarded a gold medal to the discoverer of a new process of increasing the bulk of iron.

The process is said to consist in heating the iron several times to a certain critical temperature and permitting it to cool between each heating, whereby the iron swells or increases in bulk by nearly one-half of its former cubic contents. Two castings were made from the same kind and weight of iron, one being treated by the new process and the other without being treated. Both castings were then planed off and polished in order to examine the grain and structure of the iron. Little difference could be discovered. The grain and structure in both castings seemed identical. Yet the casting which had been treated was nearly one-half larger than the untreated casting, while the weight remained the same in both castings. In all other respects the two castings were similar in character. Important practical applications will be found from this remarkable discovery.

ABSORPTION OF WATER BY GLASS.

In a report published by the Imperial German Government in 1905 quartz vessels are recommended for chemical operations on account of glass absorbing water when exposed to the atmosphere and especially sulphuric acid accumulator jars. The absorption of water produces changes in the composition of the glass, which gives up potash and soda, the water being absorbed by the silica, which undergoes molecular changes, when the glass is slowly heated to 212 Fah. Most of the absorbed water is driven off, the rest at 900 Fah. and the glass peels. When the heating is rapid, between 400 Fah. and 900 Fah., the water escapes in small bubbles and the glass turns white and does not peel.

The Marseilles Chamber of Commerce reports the world's production of Portland cement in 1904 as follows: United States, 3,000,000 tons; Germany, 2,500,000 tons; England, 1,500,000 tons; Belgium, 685,000 tons; France, 685,000 tons; Russia, 555,000 tons; all other countries, 500,000 tons.

So far as the production of Portland cement in the United States is concerned, the statement is incorrect. The United States produced slightly over 4.189,000 tons in 1904.

The Blue Seal Portland Cement Co., 264 New York Life Building, Kansas City, Mo., is after machinery for its proposed plant. L. H. Weber, president; J. H. Marshall, general manager and treasurer.

CHICAGO CONVENTION OF THE NATIONAL ASSOCIATION OF CEMENT USERS.

This convention promises to be by far the greatest ever held by this association; and should mean much to the cement trade in all its branches and to the public.

One of the principal objects of the association is to disseminate practical information based upon experience covering the best methods of using cement.

The exhibitors will display and operate the latest machinery and devices used in the production of concrete building block, sewer pipe, cement shingles, fence posts, burial vaults, as well as numerous other specialties to which Portland cement is adapted. All of the great hall known as Tattersall's, at 16th and Dearborn streets.

The exhibition hall will be available to exhibitors at midnight Saturday, January 5, 1907. The exhibition is to open to the public at noon of Monday following. The exhibits will remain intact until noon of January 12, 1907.

The exhibition hall will be open every day from 10 a. m. to 11 p. m., excepting on Saturday, January 12, when it will be open from 10 a. m. to noon only.

Electric power will be available for driving machinery, while gasoline engines can be used in the exhibition hall. Many of the exhibitors are arranging for electric signs.

Reduced Railway Rates.

1st. Round-trip tickets will be sold at one and one-third fare. Twenty-five cents extra will be charged for certifying each ticket.

Tickets can be purchased three days before the date of opening of the convention (Sunday not included) and not later than January 8, 1907. In order to obtain the reduced rate you must ask for a certificate of purchase signed by the ticket agent.

2d. In case a through ticket to Chicago cannot be obtained at the starting point, a through ticket must be purchased at the next nearest point, remembering that a certificate must in each case be obtained from the ticket agent in order to obtain the reduced return rate.

3d. It is absolutely necessary that a certificate be procured, indicating that full fare of not less than 75 cents has been paid for the going journey. It likewise determines the route via which the ticket for return journey will be sold, and without it no reduction will be made, as the rules of the individual lines provide that "No refund of fare can be expected because of failure of the parties to obtain certificates."

4th. A railway official will be present at the convention hall to sign orders of the one-third rate return fare, from January 9 to 12, inclusive.

No claim for refund will be entertained on account of holders of certificates returning to original starting point before the requisite number of one hundred certificates is in the hands of the special agents of the railways.

5th. Tickets for the return journey will be sold by the ticket agents at Chicago at the place of meeting at one-third the first-class limited fare, only to those holding standard certificates signed by the ticket agent at point where through ticket to the place of meeting was purchased, countersigned by the secretary or clerk of the convention, certifying that not less than one hundred persons holding standard certificates are present, and that the holder has been in attendance upon the convention, and viséed by a validation paster affixed at the meeting by special agent of the railways.

6th. Twenty-five cents will be collected on each certificate presented for return at one-third fare.

7th. Tickets for return journey will be furnished only on standard certificates procured not more than three days before the meeting assembles, nor later than two days after the first day of the meeting (Sunday to be counted a day), and will be available for continuous passage only; no stop-over privileges being allowed on tickets sold at less than regular unlimited fares. Certificates must be presented within three days after convention adjourns (Sundays not counted).

Hotel Accommodations.

The headquarters of the convention will be at the Auditorium Hotel.

The following hotel rates, European plan only can be obtained:

Auditorium, without bath, from $2.00 to $3.00 per day; with bath, from $3.50 to $5.00.

Great Northern, without bath, $1.25 to $3.00 per day; with bath, $2.00 to $4.00.

Grand Pacific, without bath, $1.50 and up; with bath, $2.00 and up.

Brevort Hotel, without bath, $1.50; with bath, $2.50.

Majestic Hotel, with bath, $1.50 and up.

Victoria, $3.00 to $5.00 American; $1.50 up European.

Palmer House, without bath from $1.00 to $2.50 per day; with bath, from $1.50 to $3.50 per day.

Stratford Hotel, without bath, $1.25 to $2.50; with bath, from $2.00 to $4.00.

Lexington, $1.50 and up.

Sherman House, without bath, $1.00 per day and up; with bath, $1.75 and up.

Wellington, without bath, $1.00 to $2.00; with bath, $2.50 and up.

Briggs House, $1.00 and up.

Morrison Hotel, without bath, $1.00 up; with bath, $1.50 up.

Grace Hotel, without bath, $1.50 up.

Windsor-Clifton, without bath, $1.00 and up; with bath, $1.50 to $3.00.

Saratoga Hotel, without bath, 75 cents and up; with bath, $1.50.

The Convention.

The convention will be held in the banquet hall of the Auditorium Hotel. The program so far as completed is printed below. It should be noted that morning sessions only will be held.

A GLASS AND CONCRETE HOTEL.

Messrs. Munson and Erhardt, architects, are preparing plans for a hotel building to be erected at Long Beach, Cal. It will be constructed throughout, including floors and roof, of plate and opalescent glass, and will accupy a site of 66 by 155 feet, two stories high. The columns and beams will be reinforced concrete. The opalescent glass is said to exclude heat. The hotel is, therefore, expected to be cool in summer. Even the doors will be glass. W. B. Ames, president of the Fraternal Savings Bank, and other Los Angeles capitalists, will finance the enterprise, which is estimated to cost $40,000.

The Nazareth Portland Cement Co. will rebuild its plant which was partially destroyed by fire. The old 65-foot kilns will be replaced by 120-foot kilns. A new crushing plant, a new power house, a new grinding mill double the capacity will be built and other improvements are under way. The concrete machinery foundations are all in. All new buildings will be concrete and structural steel. The works are to start up with double the former capacity in March.

The Huron Cement Co. will erect a plant at Alpena, Mich., J. B. and E. L. Ford, of Detroit, being the largest shareholders. W. C. Paxton will be general manager. The company is capitalized at $1,250,000. One hundred and twenty acres of land formerly owned by W. H. Johnson, have been purchased, and a large tract of shale land has been purchased from the state. Work on the plant will begin next spring.

The payroll of the Sandusky Portland Cement Company, at Syracuse, is now about $12,000 per month.

The Portland Cement Co., of Colorado, is erecting three large buildings.

VANCOUVER PORTLAND CEMENT COMPANY.

Victoria, B. C.

Editor Cement and Engineering News.

Dear Sir: A very interesting test, as to the use of Portland cement as a fireproofing material has been obtained recently at the works of the Vancouver Portland Cement Company at Tod Inlet, British Columbia.

About six weeks ago one of our Rotary Kilns, in which the raw materials used in the manufacture of cement is burned to clinker, had to be shut down for re-lining.

Our Rotary Kilns are lined inside with fire brick of the best quality, high in aluminum in order to stand the intense heat maintained in the kiln.

At the time the kiln had to be shut down, the company was out of the special brick required for lining their kilns and being forced to have the kiln running as soon as possible a good common Scotch 9-inch fire brick was used for the purpose, and for a trial, the men in charge of the lining of the kiln used neat Portland cement for patching up holes and for mortars, putting also a layer about 1 inch thick between the iron shell of the kiln and the brick and also between the joints. After finishing the kiln was immediately started again and run for about five weeks continuously when it had to be shut down again, owing to a hole developing visible on the outside of the shell, after cooling and entering the kiln it was found that the fire brick put in five weeks ago, had almost melted away, while the cement patch and cement lining were in perfect condition, solid, hard as a rock and not cracked or crumbled; in fact some pieces had to be taken out with a pick axe.

This is remarkable considering the intense heat kept in the kiln continuously—from 2,000 to 2,300 Fahrenheit—another proof of the usefulness of cement as a fireproofing material. The recent fire in San Francisco was an excellent example, as cement concrete buildings stood earthquake and fire better than others.

The above test not only, as already stated, gives a proof of the usefulness of Portland cement as a fireproofing material, but it also speaks well for the qualities of Vancouver Brand Portland Cement.

Adolph Neu, Chemist.

EXCESSIVE RATES ON CONCRETE BURIAL VAULTS.

The railways out of Indianapolis are exacting excessive rates on concrete burial vaults. These concrete vaults are heavy and rough castings and are shipped in carload lots, yet the simple name of burial vaults bring them under a higher classification. Consequently the industry is hampered. The interstate commerce commission has taken up the freight rate on these goods, with the view of giving the manufacturers a fair rate.

CEMENT FOR REINFORCED CONCRETE CONSTRUCTION WORK.

Constructors in reinforced concrete are beginning to consider the use of a slow setting and prompt hardening Portland cement—a cement that will show a high 24-hour tensile strength, say up to 400 pounds in 24 hours. Such a cement would have to be kilnproof, which can only be attained by the most thorough and expert compounding of the raw materials. It must be finely ground both in the raw material and in the finished product in order to produce a prompt hardening cement, all of which involves extra cost of manufacture and consequently would have to be sold at a higher price. Such a cement would enable the contractor to reduce the time of constructing a building. The forms on the lower floors could be used on the upper floors, and thus reduce the cost of material by reducing the quantity of lumber by using it over and over again for the different floors.

The manufacturers of concrete building blocks want just such a prompt hardening cement as it would reduce the time of curing their product, since the building block could be laid up in the wall in less than half the time required where a slow hardening cement is used. Such a prompt hardening cement would be a certain indication that it was not over limed, as the over limed cement never commences to take on tensile strength within 7 days and is at its best about 28 days after which it gradually begins to lose strength and may fall to pieces.

The prompt hardening cement would be an ideal one for concrete reinforced chimney construction, where the amount of each day's work is limited by the amount of strength the concrete taken on during each preceding day's work. The more prompt the hardening the greater load will it sustain. This would reduce the cost of construction, as the same number of men could do more work in a given time than at present by the use of the slow setting cements.

DRY CONCRETE.

The Indianapolis Traction Co. has filled in between the rails of its tracks on Northwestern avenue with a weak cement concrete composed of 1 part natural cement, 2½ parts sand and 5 of gravel. This mixture was deposited in place dry, the only moisture being that carried by the sand and gravel. The ready mixed filling was brought directly from the sand and gravel pits and deposited directly from wagons. As a rule railway companies do not use cement in material designed for ballasting tracks on account of packing and hardening which requires extra labor in digging up when new ties are laid or any other track work is done.

CUT RATES TO ST. PAUL.

The Transportation Committee of the Northwestern Cement Products Association announce that they have secured a cut rate amounting to one fare and a third, round trip from the Western Passenger Association from all points in Iowa, Minnesota, North and South Dakota, Nebraska and Illinois. All tickets purchased three days prior to the 16th-17th-18th of January, and presented for return tickets not later than three days thereafter shall be honored. Twenty-five cents shall be collected by the Joint Agent of the Western Passenger Association, who will be on the floor of the convention hall, for the execution of certificates.

Members must in all cases request a certificate receipt from the ticket agent from whom they purchase their ticket, and the same must be countersigned by the Joint Agent of the Western Passenger Association, and the Secretary of the Northwestern Cement Products Association before they will be good for return passage.

The hotels of St. Paul will make cut rates to every member wearing a membership badge. This is a special concession, and one that the officers trust will be appreciated by the members.

Northwestern Cement Products Association,
Headquarters, Ryan Hotel.
Martin T. Roche,
Secretary,
410 Pioneer Press Building,
St. Paul, Minn.

Consolidated With the Cement Machinery Co.

The Hoosier Manufacturing Co. and the Concrete Machine Co. of Auburn, Indiana, have consolidated with the Cement Machinery Co. of Jackson, Mich. The general offices and factory will be at Jackson, Mich. The business will be conducted under the name of the Cement Machinery Co., Jackson, Mich.

Mr. Richard J. Dickinson, of Eureka, Ill., delivered an address on Cement Construction before the Farmers' Institute at Matamora, Ill. The farming communities throughout the state consider the use of cement one of the live subjects upon which they can not have too much practical information.

CONCRETE TILE CULVERTS IN ONTARIO.

The use of concrete tile for small highway culverts in Ontario is steadily increasing, and where they have been properly made there is rarely any complaint against them, according to a special report of Mr. A. W. Campbell, commissioner of highways of the province. In some municipalities they have been in use fifteen to eighteen years without renewal, and still appear to be as good as when first laid.

Among the chief points to observe in making them, Mr. Campbell states, are that they shall be made of good materials, the concrete carefully mixed, and that they are not too small. The size is controlled to some extent by the depth of the side drains below the graded roadway, as it is necessary that there should be a foot of earth over the pipe. It is not desirable to use pipe less than 18 inches in diameter if the situation will permit; but two smaller lines of pipe may, as an alternative, be laid side by side. The objection to small pipe is that they are liable to be stopped up. In striving to keep down expense, there is a tendency to use concrete tile where a large waterway is needed. This is the reverse of economy, for by contracting the water area, drainage is impeded, the road-bed is injured, and washouts frequently result. Concrete tile are excellent in their place, where they give sufficient waterway, but provisions should always be made for the maximum rushes of water, not the average flow. Where concrete tile are too small for this, concrete arches, or square top culverts should be considered.

The construction and repair of wooden culverts has become, in numerous townships, a serious drain upon the yearly appropriation available for road purposes. In some cases Mr. Campbell finds that as much as half or two-thirds of the grant from the general funds is absorbed in this way, a matter of from $1,000 to $2,000 annually. The number of these culverts on country roads varies greatly. Ordinarily half a dozen are needed for each mile of road if proper drainage is provided. By replacing these, as required, with permanent concrete culverts, this annual expenditure can be almost wholly wiped out.

Making concrete tile for culverts is not a difficult matter, and can be undertaken by the municipalities themselves, although in numerous cases they are now manufactured as a private enterprise. Just such a number of pipe as are actually required for the season's work need be manufactured; the implements required are inexpensive, and the pipe may be made by the municipality for actual cost, which, after a little experience, can be reduced to a very small amount. The outfit required consists of two cylinders; the larger hinged, the smaller a spring cylinder; bottom and top rings; and a tramping iron. The one cylinder forming a core, sets inside the other, leaving a space between the two equal to the thickness of the finished concrete pipe. These can be procured from the manufacturers of roadmaking machinery. By a "spring cylinder" is meant one formed by rolling a steel plate into a tube without sealing the joint. With the smaller of these cylinders the edges overlap or coil slightly, but are so manufactured that they may be forced back and set into a perfect cylinder. In the case of the larger cylinder, the shell is cut into two parts with hinges on one edge, and latches on the other. Bottom and top rings shape the bell and spigot ends of the pipe.

The two cylinders, with joints flush, are set on end, the one centrally inside the other and on the bottom ring, which in turn rests on a firm board bottom. The concrete, made of first-class cement, and clean, screened gravel, is then tamped firmly into the space or mold between the two cylinders. The tamping-iron used to press the concrete into place is so shaped as to fit closely to the cylinder.

The concrete is allowed to stand in the mold for a short time, when the cylinders are removed; the outer and larger cylinder by unfastening the clamps, and swinging the shell open on its hinges; the inner cylinder by removing the fastenings, so as to allow the edges to again overlap, returning to the shape of a coil. The outer cylinder having thus been opened and the inner one made smaller, they can be readily taken away, and the concrete pipe is then left until thoroughly hardened.

The concrete adheres closely to the metal, and to overcome this it is necessary to keep the molds well oiled. This should be done after each tile is made, and when the molds are by this means kept perfectly clean, a smooth and uniform pipe of good appearance will be obtained. A good mixture for oiling the molds is composed of two parts of machine oil to one part of coal oil.

To secure a durable pipe it is necessary to exercise much care in mixing the concrete, and Mr. Campbell particularly advises the use of Portland cement. If gravel is used, it should first of all be clean. Any earthy material, clay, or vegetable mold will create a flaw in the pipe, which will lead to its early destruction, and durability is the quality most to be desired. The gravel should be of a size that will pass through a one-half inch screen, and should be of varying sized grain, in such proportion as to make a compact mixture. The gravel forms the greater part of the mass of concrete, and it is evident that the results will depend very largely on the quality of the gravel.

The materials should be mixed in the proportion of one part of Portland cement to two parts of gravel. They should first be turned over in a dry state until thoroughly intermixed and of uniform color. Water should then be added. This, like the gravel, should be clean, and there should be just enough to moisten the mass of concrete, making it of the consistency of a stiff mortar. An excess of water tends to injure concrete in various ways, and is especially to be avoided in the manufacture of tile, as the tamping cannot be properly performed. when too much water is used. When the water has been added, the mixture should be made uniformly moist, by turning it over several times with a shovel. The concrete is then ready to be placed in the molds, in which it should be firmly and vigorously tamped.

Such a quantity of concrete should be mixed as can be put in the molds before the process of setting has commenced, and it is therefore of importance to know how long the brand of

IMPORTS OF CEMENT INTO THE UNITED STATES.

WHERE FROM	OCTOBER				TEN MONTHS ENDING OCTOBER			
	1905		1906		1905		1906	
	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars	Quantity in lbs.	Value in Dollars
United Kingdom..	6,525,600	$ 20,516	29,104,710	$82,981	13,421.400	$ 42,333	154,378,456	$ 450.695
Belgium...........	5,631,026	15,703	49,197,690	141,356	111,075,721	350,644	188,070.223	624,870
France............	297.600	1,277	453.900	1,574	5,811.400	20,930	12 084,872	39,675
Germany	25.664.824	96,497	60,522,176	186,613	131,350,903	447,040	242,112,433	782,715
All Other Europe.	......	......	......	......	240.659	609	298,253	920
British North Am.	35,400	204	675,733	5,045	165.110	1,591	3.331.073	23,453
Other Countries..	......	......	6,594,900	28,879	469 615	1,783	66,295,302	302,495
TOTAL......	38,154,450	$134,197	146,549,109	$446,451	262,531.808	$864,930	666.570,612	$2,224,823
Domestic Exports of Cement, bbls.	76,135	$108,027	31.978	$54,093	877.516	$1,194,041	480,318	$769,280

There were 7.208.644 lbs. of imported Roman and Portland Cement, etc., in the United States bonded warehouses in Oct. 1905, valued at $21,789, against 13 922 665 lbs. in Oct. 1906, valued at $17,997.

For 10 months ending in Oct 1905, there were 80,282 tons of asphalten imported in the United States, valued at $3 9,489 against 80,010, tons imported in 10 months ending Oct. 1906, valued at $356,978.

cement used can be worked before setting begins. A moderately slow-setting Portland cement is necessary for this work. Ordinarily it is best to mix enough to fill one mold at a time. Remnants of concrete which have commenced to set should be thrown away, in Mr. Campbell's opinion, and under no circumstances should they be worked up again and used, as, he believes, they are certain to cause a defective pipe. Defects which do not appear until after the tile have been placed in a culvert and covered with earth cause not merely the loss of the pipe, but a considerable outlay for labor is wasted as well. The concrete should be handled quickly. Two men are needed, one to shovel it into the molds, and the other to tamp it.

Until the concrete has hardened sufficiently the molds should not be disturbed. When the pipe has attained sufficient strength (which it should do in from five to seven hours, according to the temperature of the atmosphere, and the kind of cement used), it can be taken off the bottom rings. To enable the pipe to set satisfactorily they should be dampened every day for several days, if the weather is dry, and should be protected from the direct rays of the sun in hot weather. They should not be used for some time after being made, but should be allowed to season for from four to six weeks.

The molds for manufacturing these tile may be obtained in various sizes, the more common being for tile ranging from 10 to 30 inches in diameter. The molds are such as will manufacture pipe 2½ feet long. One set of bottom rings—those for forming the bell of the pipe—go with each set of molds, but it is advisable to have about three sets of bottom rings for each pair of cylinders, to permit the maximum number of pipe to be made in a day.

If the best results are to be obtained from the use of concrete tile culverts, the tile must be put in place with reasonable care, and Mr. Campbell's suggestions on this head read as follows: It is, in the first place, necessary that they shall be laid with a good fall on a regular grade to a free outlet, in such a way that water will not stand in them. Lay the tile with the spigot end down grade, and make the joints tight with cement mortar. If the joints are open, water will work along the outside of the culvert, and finally make a considerable channel, which will allow the culvert to get out of line and finally result in a cave-in. To prevent the water finding its way along the outside of the pipe, it is advisable to protect the ends with concrete, stone or brick head-walls.

Excavate a concave bed for the pipe, with depressions for the bell of the pipe to rest in, thus securing an even bearing, without which a heavy load passing over before the culvert has properly settled into place may burst the tile. Tile cannot be used in very shallow culverts, but must have a sufficient depth of earth over them to protect them from the direct pressure of heavy loads. The depth of covering necessarily increases with the size of the pipe. At least a foot of earth over the top is advisable in every case; but for culverts of 2 feet in diameter or over, this should be increased at least 18 inches. The earth should be well packed and rammed around the tile to secure a firm bearing, and light soils should not be used immediately over or around the culvert. A heavy clay, a firm gravel, or a compact sand will answer, but vegetable mould, water, sand and light loams are subject to washouts.

As to the outlet, the culvert should be set nearly flush with the surface of the ground. If set higher than the surface, the fall of water will wash out a depression, and in time will undermine the end of the culvert. A too rapid grade will have the same effect, and it is well to cobblepave an outlet where this undermining action is likely to occur.

A LARGE CONTRACT.

The Ideal Concrete Machinery Company Secures $250,000 Order for Ideal Concrete Block Machines—Making Heavy Foreign Shipments.

The heaviest individual order for concrete machines in the world was negotiated recently by the Ideal Concrete Machinery Company, of South Bend, Ind., with a large eastern concern, which deals extensively in concrete machine and construction supplies, the order amounting to the magnificent sum of $250,000.

The figures tend to show the wonderful sentiment that is developing throughout the country in favor of concrete as a building material. The recent disasters at Buffalo, N. Y., and at San Francisco have contributed largely to the movement in this direction as in both instances the buildings of concrete were the only ones to resist the ravages of the destructive elements.

The Ideal Concrete Machinery Company has made rapid strides since its location in South Bend about two years ago. The company is doing an extensive business in foreign countries. The United States government has constructed the Provincial building at Zamboango, P. I., of "Ideal" blocks, and the engineer reports very favorably on the appearance. Other big contracts have been received for export shipments.

WALKING DELEGATES AND U. S. PATENT OFFICE.

What Carnegie Said About Walking Delegates.

Secretary Hitchcock advanced recently the idea that the congestion of Patent Office work is due to labor union agitation for higher wages. "Andrew Carnegie told me some years ago," he said, "that he would give $5,000 for every piece of machinery which would do away with the labor of a single workingman, not that he expected to operate his mills without men, but to cut down as much as possible the possibilities of interference by the walking delegate. I do not stand in hostility to labor organizations, but I do say that attempts to force up wages, by concerted action, have driven manufacturers to look about for new labor-saving machines, and this demand has stimulated inventors and caused some of them to clamor for quicker action upon their applications before the Patent Office."

MORE ROOM NECESSARY.

On account of the phenomenal growth and development of the business of the Ideal Concrete Machinery Company of South Bend, Ind., they have found it necessary to vacate their present factory building and have leased the plant formerly occupied by the Bissel Plow Company, which will give them three times their present floor space, and other facilities which will materially assist in promptly taking care of the ever-increasing demand for "Ideal" concrete machines. We hear a good deal in these days of rapid business development, but we think that the "Ideal" people are holding their own with any of them.

NOTICE.

The Osborn Engineering Company, Cleveland, O., has recenty associated with it Mr. S. Henry Harrison, formerly superintendent of power and mahinery of the Vulcanite Portland Cement Company, Vulcanite, N. J. Mr. Harrison will have charge of cement plant designing and engineering. The Osborn Engineering Company is now designing a large cement plant for the Pacific Coast.

The new plant of the Lehigh Portland Cement Co., one-half mile east of the Bellevile Portland Cement Co.'s plant, in Hastings county, Ontario, will be the largest in Canada and have a daily capacity of 6,000 barrels. The company's holdings cover 800 acres of land carrying lime rock and clay.

Altoona, Kan., has offered free fuel to any cement company that will locate within the town.

TENTATIVE PROGRAM FOR THE THIRD CONVENTION OF THE NATIONAL ASSOCIATION OF CEMENT USERS, CHICAGO, ILL., JANUARY 7-12, 1907.

Monday, January 7, 1907.

1. Formal opening of exhibits in Tattersall's, 12 o'clock noon.

Tuesday, January 8, 1907.

2. 10 a. m. Formal opening of convention. (Banquet Hall, Auditorium Hotel.)
3. Business session.
4. Paper on Cement Sidewalks, Albert Moyer.
5. Report of Committee on Streets, Sidewalks and Floors, George L. Stanley, Chairman.
6. Paper on Proportions, Mixing, etc., for Mortars and Concrete.

Tuesday Evening, January 8, 1907.

7. 8 p. m., President's Address.
8. Paper on Reinforced Concrete, W. K. Hatt.
9. Paper on Reinforced Concrete, S. W. Thompson.

Wednesday Morning, January 9, 1907.

10. 9-10 a. m. Sectional meetings.
11. 10 a. m. Business session.
    (a) Report Executive Committee.
    (b) Place next convention.
    (c) Election of officers.
12. Paper on Proportions, Mixing, etc., for Mortars and Concretes.
13. Report of Committee on Testing Cement and Cement Products, E. S. Larned, chairman.

Wednesday Evening, January 9, 1907.

14. 8 p. m. Paper on Artistic Use of Concrete, A. O. Elzner.
15. Paper on Finish for Concrete Surfaces, A. O. Elzner.
16. Paper on Concrete as a Plastic Material, H. H. Quimby.
17. Report of Committee on Art and Architecture, Chas. D. Watson, chairman.

Thursday Morning, January 10, 1907.

18. 9-10 a. m. Sectional meetings.
19. 10 a. m. Paper on Concrete Blocks, H. H. Rice.
20. Report Committee on Concrete Blocks and Cement Products, M. S. Daniels, chairman.
21. Report Committee on Machinery for Cement Users, J. F. Angell, chairman.
22. Paper on Concrete Block Architecture,

Thursday Evening, January 10, 1907.

23. 8 p. m. The members of the association will be guests of the local cement interests.

Friday Morning, January 11, 1907.

24. 9-10 a. m. Sectional meetings.
25. 10 a. m. Waterproofing.
26. (a) Edward De Knight.
27. (b) J. W. Fist.
28. (c) G. G. Fry.
29. (d) H. Weiderhold.
30. G. G. Fry, Indianapolis, Ind.
31. Report of Committee on Fireproofing and Insurance, E. T. Cairns, chairman.

Friday Evening, January 11, 1907.

32. Business session.
33. Report Committee on Laws and Ordinances.
34. Paper on ————————.
35. Paper on ————————.
36. Adjournment.

Saturday Morning, January 12, 1907.

37. 12 noon. Closing exhibits.

IOWA ASSOCIATION OF CEMENT USERS.

At a recent meeting of the executive committee of the Iowa Association of Cement Users it was decided to hold the third annual convention at the Iowa State College at Ames, January 23, 24 and 25, 1907.

Boston, December 4, 1906.

Editor Cement Engineering News.

Dear Sir:

In your November issue you mention the use of machinery for dressing natural stone, displacing hand-cut stone, and that the same machinery might be applied to the dressing of concrete. Can you give any definite figures on the actual amount of work such a machine will turn out compared to hand-dressed work?

Answer: The machinery for dressing natural stone covers only straight work such as belt courses and mouldings for window caps and sills. In this class of work one machine operated by two men will turn out as much work per day as 20 men can do in one week.

Concrete work such as newel posts and columns have been dressed on lathes with economy, the finish being excellent.

The Century Cement Machine Co., of Rochester, N. Y., makers of the Hercules Concrete Stone Machine, has arranged for a magnificent exhibition and a complete demonstration of its products at the convention of the National Association of Cement Users to be held in Chicago, January 7th to 12th. It will be a show worth seeing, and we would advise our readers not to miss it.

THE CEMENT USERS' OPPORTUNITY

The Ideal Concrete Machinery Co. will have a complete line of concrete block machinery on exhibition at the Third Annual Convention of the National Association of Users, which is to be held at the Tattersall Building, corner Dearborn and Sixteenth streets, Chicago, from January 7th to 12th, 1907.

During the past year they have perfected a complete brick machine which can also be used as an attachment to their well-known block machine.

An extensive set of friezes and belt courses so arranged as to give perfect return corner effects, will greatly please and interest contractors, builders and architects.

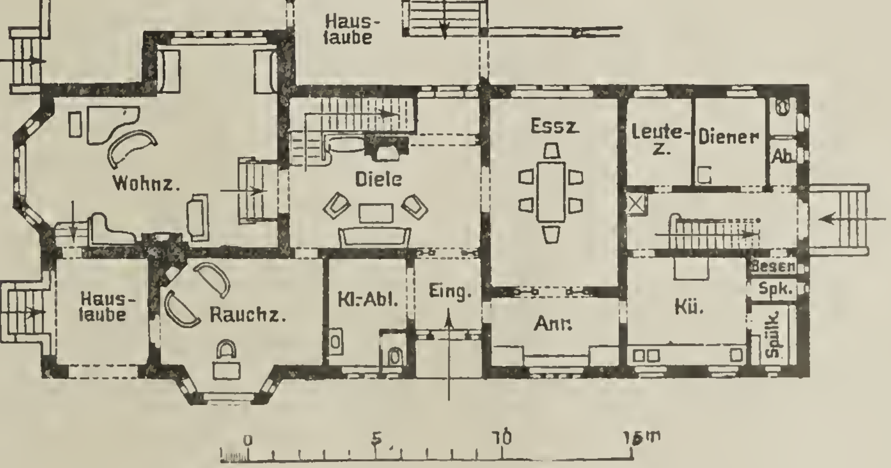
A new water table set with return corner attachments; new circle plates with end angle attachments and inner angle scrapers; new metal ties adaptable to their silo block attachments; tiles in elaborate designs produced on the Ideal machine at the rate of twelve at a time, are some of the good things which the company have in store for delegates and visitors at the Convention.

The new Model "E" interchangeable 24-inch block machines will also be shown. New face plates in endless variety. Porch pier block molds with fluted corners, and round designs, will further prove that this company intends to remain in the lead.

Fence post molds to interest the agricultural and railroad visitors.

Their leading attraction, however, around which centers the great interest of this splendid array of new features, will be the Ideal Concrete Mixer, which they have at last brought to that perfection of detail which entitles it to be classed an "Ideal." It is *the* machine for the block maker.

Our readers are cordially invited to inspect this exhibit, and we can assure them that at the headquarters of the Ideal company they will find a corps of attendants who will be pleased to explain as well as demonstrate by actual operation everything shown.



Floor Plan of Villa of Heikendorf.

REINFORCED CONCRETE CONSTRUCTION IN SAN FRANCISCO.

By Horatio F. Stoll, Publicity Bureau, The California Promotion Committee.

Already it is quite apparent that reinforced concrete is to enter largely in the reconstruction of San Francisco. There is scarcely a block in the down-town burned district that will not soon boast of at least one reinforced concrete building, for they are to be seen on every hand in various stages of construction. The five-story Flannery building, on the corner of Geary and Market streets, is the first structure of its kind to be occupied. The Freeborn Estate Company is erecting a three-story office building a few blocks below on Market and, at the corner of Davis and Market, the Lichstein Realty Company's three-story office building has reached the second story. The Hooker Estate Company is putting up a four-story concrete building on Battery between Pine and Bush, and E. W. Hopkins a seven-story structure on Pine and Leidesdorff. South of Market two pretentious office buildings are rapidly rising. One is the eight-story Bride Investment Company building on Mission street near Third, and the other is the Morton L. Cook building on the west corner of Second and Minna.

The most notable reinforced concrete building which has yet been announced for San Francisco is to be erected on the corner of Fourth and Market streets, the site of the old Flood building. It will be nine stories high and will cost $1,000,000. Its exterior, for the first two stories, will be veneered with ceramic tile in rich browns. Above the second story the entire front will be faced with cream color glazed terra cotta in rich detail. The corridors and lobbies will be finished in imported marbles and six electric high speed elevators will be installed. All the offices and stores will be trimmed in mahogany. A splendid law library will be installed in the buiding for the use of the attorneys who may be tenants. The building will have a complete heating, lighting and power plant sufficient to provide for the needs of all the neighing buildings.

One remarkable feature of this concrete structure, as pointed out by the architect, Charles F. Whittlesey, is the fact that nine stories are made possible within the limit of height to which concrete buildings are restricted by the city ordinance—one hundred and two feet. The first story will have a weight of twenty feet; the second, twelve feet, and the other stories ten feet each. By an ingenious arrangement of the structure, the fact of the roof is of concrete, makes it possible to dispense entirely with an attic story.

Reinforced concrete experts declare that no other construction will stand fire and earthquake as well as reinforced concrete. And according to investigations made by the California Promotion Committee it would seem that the facts bear out this assertion. It is well known, for example, that the museum at Stanford University was built seventeen years ago of reinforced concrete, being the first building of its kind in California. As compared with our modern methods, it was a very crude example of reinforced concrete construction. Nevertheless, it stood the earthquake admirably. One statue was thrown from the top and all the marble statuary in the interior was toppled to the floor and broken. The pictures on the walls were swung with their faces toward the wall. However, the building sustained no damage, not even being cracked in the slightest extent. The girls' dormitory was also of concrete construction except in the roof. The roof was badly damaged, but the remainder of the building was but slightly injured.

In San Francisco, the Bekins warehouse was constructed with brick walls and reinforced concrete for all other parts, such as floors, girders and interior columns. This building sustained practically no damage either from fire or earthquake. At the time of the quake, the building was under construction and but two stories had been completed. The first story had already been filled with inflammable merchandise, which was entirely consumed. The building was not damaged in the least.

There were many other buildings in San Francisco having reinforced concrete floors. The National Board of Fire Underwriters' report of the San Francisco disaster shows that less than five per cent of these reinforced concrete floors were damaged.

In the Baltimore fire there were two buildings of reinforced concrete in the hottest part of the conflagration. One of these was five stories high with brick walls and all the interior construction of reinforced concrete. The brick walls were destroyed by the intense heat, leaving the entire interior construction standing with the full five stories practically undamaged and requiring only the outer walls to be replaced to fit the building for use. The other building was a bank. The first two stories were of reinforced concrete construction with three stories of brick and timber. The upper stories were entirely destroyed, heaping great piles of debris into the top of the two concrete floors. The two concrete stories suffered no damage, not even the woodwork being burned.

In Los Angeles, reinforced concrete has been more extensively used than in any other city in the United States up to the present time. The immense Auditorium building, which has just been opened with a season of grand opera, is unique in many ways. Being entirely of reinforced concrete construction, it has probably the best acoustics of any large opera house in the world to-day. It is possible to hear the prompter on the stage from the farthest seat in the top balcony, which is 130 feet from the curtain fly. When it is remembered that the limit of range of the ordinary human voice is only seventy-five feet, one begins to comprehend this remarkable fact.

The Auditorium building is further noted for three features which have never before been undertaken in reinforced concrete construction—a concrete roof construction, a great balcony overhang, and cement girders carrying extraordinary loads. The balcony was loaded with a test load of 680 pounds to the square foot and, as the overhang is thirty-one feet, it was expected that the deflection would be considerable. As a matter of fact, it was only one-twelfth of an inch on the front. Great trusses were used in this building, 112 feet in height, with a depth in the center of eleven feet. When the false work was removed, they showed so little deflection that it was hardly measurable. With an applied load of 100 pounds to the foot, they showed a deflection of only an eighth of an inch. The girders made a span of 42 feet and have a depth of 63 inches. They carry a concentrated load of 100 pounds to the foot, the center load being a concrete column running through five stories and an attic. While greater spans for bridge work have been executed in reinforced concrete, no roof construction has ever been attempted before that approaches this in magnitude. It shows the almost unlimited possibilities of reinforced concrete construction, which, in fact, is still in its infancy.

GRANITE BLOCK PAVED STREETS

Granite block paved streets are out of date in Washington, both for resident streets and business thoroughfares. For resident streets they are too noisy. While business men claim that trade is being diverted to merchants located on asphalt and other smooth paved streets. Under an act of Congress granite block paved streets cannot be repaved or improved. Were it not for this statute the engineering commission for the District of Columbia would recommend the removal of all granite block pavements in the city, excepting on a few streets where the traffic is extra heavy.

STANDARD SPECIFICATIONS FOR SHEET ASPHALT PAVEMENTS.

Specifications.

Prepared by The Engineering Commission of the District of Columbia.

1. *Work.*—The work to be done under this contract will consist of paving with sheet asphalt such streets, avenues and roads, or parts thereof, or doing any portion of such work, as may be directed under appropriations for the fiscal year ending June 30, 1907. The estimated amount is 17,000 square yards of asphalt surface and 2,500 square yards of vitrified-block gutter. These amounts are approximations only and may be considerably varied from; but they will be used in canvassing bids, and the award will be based thereon. The commissioners especially reserve the right to regulate the time and order of executing work ordered under this contract as may appear most advantageous to the interests of the district.

2. *Bids.*—The contractor will, for the prices bid, do all the work prescribed in these specifications, do all the necessary grading and trimming of the roadbed, and all rolling; provide bridges, fences and other means of maintaining travel on intersecting streets, road and railroads, and all private driveways after giving due notice to parties affected thereby; maintain the same in good and safe condition as long as may be necessary, and then remove such temporary expedients and restore such roads to their proper condition; provide watchmen, red lights, fences and other precautionary measures necessary to the protection of persons and property; furnish all materials (except as specified) and all tools and implements, labor and transportation required to lay and put in complete order for use the specified pavement, and do each and all of these to the satisfaction of the Engineer. Upon the completion of the work he will remove any temporary structures erected during the progress of the work and restore all fixtures, pavements and parkings, both public and private, to satisfactory condition.

3. *Grading and subgrade.*—The area over which the pavement is to be laid must be excavated to the proper depth below the surface of the pavement when completed, any objectionable or unsuitable matter below the bed being removed to such depth as may be directed by the engineer and the space filled with good gravel or other acceptable material, compactly rolled and rammed. The bed, after being trimmed so as to be parallel to the surface of the pavement when completed, will be thoroughly compacted by rolling with a roller weighing not less than 5 tons and by heavy ramming at places which cannot be reached by the roller, dampening the bed before rolling and ramming, if required, to the satisfaction of the engineer. No extra allowance will be made for trimming or rolling, but the volume of earth, etc., removed will be paid for as grading of its class.

4. *Concrete base.*—Upon the bed thus prepared there will be laid a 6-inch foundation of concrete as directed, made of the following materials by volume: 1 part Portland cement, 4 parts sand, 5 parts gravel and 5 parts stone. Broken stone, run of the crusher, may be substituted for part or all of the gravel, at the option of the contractor.

5. *Cement.*—The cement used shall conform to the current specifications for supplying cement of its kind to the engineer department of the District of Columbia. No cement shall be used upon the work until it has been tested in the office of the engineer commissioner and accepted by him, the tests to extend over such length of time, not exceeding twenty-eight days, as the engineer commissioner may think necessary. The cement while in storage or upon the work, or while being hauled upon the work, shall be properly protected, and no cement shall be used which, in the opinion of the engineer commissioner, has been injured by age or exposure. The cement shall be kept by the contractor in store, under proper cover, in the city of Washington, subject to inspection for at least ten days after notifying the inspector of asphalt and cements, before it can be used on the streets, and, if deemed advisable by the engineer commissioner, twenty-eight days Should the contractor's work be delayed by his failure to keep himself supplied with the necessary amount of approved cement, the district shall have the right to furnish him with tested cement from the stocks on hand at its warehouse and charge said contractor with the cost of same at the rate of $2.50 per barrel of Portland cement for each and every barrel so furnished, and collect the amount due therefor from any moneys found to be due to said contractor by the district.

6. *Sand.*—The sand used shall be clean, sharp river sand, containing both fine and coarse grains, but free from sewage, mud, clay, mica, paper, leaves, chips, and other foreign matter and not showing, when shaken with water and after subsidence, more than 5 per cent by volume of silt.

7. *Broken stone.*—Stone used in concrete must be hard, durable and properly broken to a size small enough to pass through a ring 2 inches in diameter, but none smaller than one-half inch, except when the run of the crusher is substituted for gravel. The run of the crusher shall not contain over 1 per cent of material passing a No. 10 sieve. The stone shall be thoroughly cleansed from all foreign substance, and shall be screened and washed if so ordered by the engineer. Sand, detritus, or any material other than hard, angular fragments of stone will be considered foreign substances.

8. *Gravel.*—Gravel shall be clean, washed gravel, and shall not contain pebbles greater than 1½ inches in their largest dimensions.

9. *Water.*—Water used for mortar and concrete shall be fresh and clean, free from earth, dirt, or sewage, and shall be used in such quantity as the engineer may direct.

10. *Platforms.*—Platforms shall be provided upon which all sand, gravel and broken stone for concrete shall be placed when brought upon the line of the work, and kept there until used.

11. *Mixing.*—The thorough mixing and incorporation of all materials will be insisted upon. If done by hand labor, the dry cement and sand shall be turned over and mixed with shovels by skilled workmen not less than six times before water is added; the stone after being drenched with water shall be added to the mixed sand and cement; the drenching shall not be done while the stone or gravel is in the wheelbarrow; the whole mass shall be thoroughly turned over with shovels not less than four times, and mixed upon a water-tight platform until every particle of stone is completely enveloped with mortar. The whole operation of mixing and laying each batch shall be performed as expeditiously as possible by the aid of machinery or a sufficient number of skilled men. If the concrete is mixed in batches requiring one barrel of cement, the platform must not be smaller than 10 feet by 12 feet, nor will a larger amount of concrete than can be made with one barrel of cement be allowed to be mixed in one batch by hand. In mixing by machinery the materials must be so delivered as to insure a uniform product of the specified proportions of all ingredients to the satisfaction of the engineer commissioner.

12. *Setting.*—Concrete shall not be used after it has begun to show evidence of setting. No concrete which has once set shall be used as a material for mixing a new batch.

Each batch of concrete after being mixed shall be spread in place in horizontal layers so as to give the requisite thickness after being tamped, and shall then be thoroughly compacted. Any evidence of lack of compaction will be regarded as sufficient reason for removal and replacement of the base. The base must be watered each twenty-four hours, either by rain or artificially, until covered with binder or seven days old. Hauling over base less than three days old must not be allowed unless planks are laid.

13. *Binder.*—The binder course shall be composed of clean, broken stone, equal in quality to the stone for the base, and passing an inch and a quarter screen. Eighty-five per cent of this shall pass said screen in its longest dimensions, and of the remaining 15 per cent no piece shall have a larger dimension than 2 inches, and the stone, after passing the heating drums, shall not contain less than 5 nor more than 15 per cent of material passing a No. 10 screen.

The stone will be heated not higher than 350 degrees F., in suitable appliances. It is then to be thoroughly mixed by machinery with asphalt cement, such as is acceptable for surface cement, penetrations 60 to 90, at such temperature and in such proportions that the resulting binder will have life and gloss without an excess of cement. Should it appear dull from overheating or lack of cement, it will be rejected. While hot it will be hauled upon the work, spread upon the base so that when compacted it will be at least 1½ inches in thickness, and immediately rammed and rolled until it is cold. Should the resulting course not show a proper bond, it shall be immediately removed and replaced by the contractor. Binder and top shall not be taken from the yard to the site of the work when weather conditions are, in the judgment of the engineer, unsuitable for the work of laying the pavement.

The contractor shall not enter upon a concrete base in order to lay the binder course until it has obtained sufficient strength for such a purpose, and during the period between laying the base and binder he shall properly protect it, and, when ordered by the engineer commissioner, shall sprinkle it in warm weather between the hours of sunset and sunrise as often as may be deemed necessary, and in cold weather cover it with a material suitable for its protection.

14. *Asphalt wearing surface.*—The wearing surface of the pavement shall be composed of asphalt cement, clean, sharp-grained sand, fine absorbent mineral dust.

15. *Asphalt cement.*—The asphaltic cement must be practically free from water, and must be within the range of 40 and 70 penetration when tested at 77 degrees F. The amount of penetration to be fixed by the engineer commissioner.

Preference will be given to an asphaltic cement that is not readily affected by the action of water, provided it is satisfactory in other respects. If an asphaltic cement is accepted that is affected by water, some provision satisfactory to the engineer commissioner must be made to guard against the result of such action, and such work must be included in the price bid.

If an asphalt has been proposed for use by the contractor and approved by the engineer commissioner no change in the asphalt to be used shall be made unless with the approval of the engineer commissioner. If an asphalt is submitted for use which has not been successfully used for a period of at least two years for paving under conditions similar to those existing in the District of Columbia, its use may be limited to such extent as may be deemed advisable, or it may be rejected for use entirely in the discretion of the engineer commissioner.

The bitumen of the asphaltic cement must comply with the following tests:

1. It must be of such a character that if, when tested at 32 degrees F., it shows a hardness of 10 penetration, it must not, when tested at 115 degrees F., be softer than 350 penetration.

2. When a briquette of the pure bitumen having a minimum cross section of 1 square centimeter is tested for ductility at 77 degrees, the bitumen must stretch to a distance of 8 centimeters before breaking.

3. When the bitumen is heated in an open tin at a temperature of 300 degrees F. for eighteen hours in a hot-air oven, it must not show a loss by volatilization of over 5 per cent, and it must not have been hardened over 50 per cent by this heating.

The asphaltic cement must never be heated to a temperature that will injure it.

When the asphaltic cement contains over 5 per cent of material that will separate by subsidence while in a molten condition, it must be thoroughly agitated before drawing from storage and while in use in the supply kettles so as to insure a uniform cement.

These properties shall be determined by tests made by uniform methods, descriptions of which are on file in the office of the engineer commissioner.

16. *Sand.*—The sand in use shall be hard grained and moderately sharp. On sifting it should have at least 15 per cent of material that would be caught on a 40 mesh per inch screen, 25 per cent of material that will pass an 80 mesh to the inch screen, 10 per cent of which at least must pass a 100 mesh to the inch screen. If the sand to be used does not contain the desired fine material, mineral dust can be added to make up the deficiency, and in any case at least 5 per cent of such mineral dust shall be used. The amount of fine material may be diminished on streets of light traffic when approved by the engineer commissioner.

17. *Mineral dust.*—This shall be any fine, absorbent, inorganic dust not acted upon by water, the whole of which shall pass a 30-mesh screen, and at least 75 per cent pass a 100-mesh screen.

18. *Asphalt paving mixture.*—The materials complying with the above specifications shall be mixed in proportion by weight, depending upon their character, and the traffic on the street, and upon the character of the asphalt, and will be determined by the engineer commissioner, but the percentage of bitumen in any mixture soluble in carbon bisulphide shall not exceed the limits 9 to 13 per cent. If the proportions of the mixture are varied in any manner from those specified, the mixture will be condemned, its use will not be permitted, and, if already placed on the streets, it will be removed and replaced by proper materials at the expense of the contractor.

The sand, or the mixture of sand and stone dust, and the asphaltic cement will be heated separately to about 300 degrees F. The dust, if limestone, will be mixed while cold with the hot sand in the required proportions and then mixed with the asphaltic cement at the required temperature, and in the proper proportion in a suitable apparatus, so as to effect a thoroughly homogeneous mixture. Sand boxes and asphalt gages will be weighed in the presence of inspectors as often as may be desired.

Samples of all material entering into the composition of the pavement shall be supplied to the inspector of asphalt and cements when required, in suitable tin boxes and cans, and he shall have access to all branches of the works at any time.

The pavement mixture prepared in a manner thus indicated will be brought to the ground in carts at a temperature of not less than 250 degrees or more than 350 degrees F., and if the temperature of the air is less than 60 degrees F., the contractor must provide canvas covers for use in transit. It will then be thoroughly spread to a thickness of at least 2½ inches by means of hot iron rakes, in such manner as to give uniform and regular grade, so that, after having received its ultimate compression, it will have a net thickness of at least 1½ inches. This depth will be constantly tested by means of gages furnished by the engineer commissioner. The surface will then be compressed by hand rollers, after which a small amount of hydraulic cement will be swept over it, and it will then be thoroughly compressed by a steam roller weighing not less than 175 pounds to the inch, the rolling being continued for not less than five hours for every 1,000 yards of surface.

19. *Asphalt base.*—In resurfacing work where the depth of binder would be excessive an asphaltic or coal tar base, as directed, will be first laid. It will be composed of clean broken stone, free from spalls, that will pass through a 3-inch ring, well rammed, and rolled with a steam roller weighing not less than 5 tons. The rolling will be continued until the stone ceases to creep before the roller, and until it is evident that the final compression has been reached. It will then be thoroughly coated with asphaltic paving cement or coal tar of approved quality, as directed.

20. *Hauling and grading.*—(*a*) The old material from the streets will be hauled to the nearest property yard or to such other point as the engineer commissioner may direct.

(*b*) Lines and grades will be established by the engineer commissioner, and no work will be commenced until these are given.

(*c*) Contractors are to be responsible for the proper preservation of all stakes, etc., set by the engineer for the determination of line or grade; should any such be disturbed through carelessness the cost of replacing same will be charged against the contractor at a fixed price of $2 for each point, to be deducted from any money due at final settlement.

(*d*) All material excavated, of whatsoever nature, is the property of the district, and will be disposed of as the engineer commissioner shall direct.

(*e*) The filling will be done in layers not exceeding 12 inches in thickness, and all material used for this purpose will be subject to approval. If improper or unsuitable material be used, it will be removed at the cost of the contractor.

(*f*) All measurements will be made in place, and payments made thereon.

(*g*) Should the grading involve work in both "cut" and "fill," the measurement of it will be computed on the basis of the volume of the material in place in the "cut" only; the excavated earth from the "cut" section, deposited in the "fill," will not be again paid for as "fill." Should the amount of cut on the street not suffice to make the necessary fill, the amount borrowed from other designated localities will be paid for as grading.

21. *Laying vitrified block.*—Vitrified-block gutters will ordinarily be about 28 inches wide, laid on a concrete base 6 inches in depth, of the same material and proportions and laid in the same manner as prescribed in these specifications for the concrete base under asphalt pavements.

As soon as practicable after the concrete base has been laid, a dry mixture, composed of four parts of the sand specified in paragraph 6, and one part of Portland cement, thoroughly mixed, will be spread thereon, as a bed for the paving blocks, to the depth of not less than one-half inch, and regulated so as to be exactly parallel to the finished grade of the gutter. On the bed prepared for them the blocks will be set on edge, with the longest dimensions at right angles to the curb, as directed by the engineer.

The longitudinal joints of each course of blocks laid must be broken by a lap of not less than 4 inches.

The block will then be carefully rammed by placing a plank over several courses and ramming the plank with a heavy rammer. The ramming will be continued until the blocks reach a firm, unyielding bed, and present a uniform surface, with proper grade. Any lack of uniformity in the surface or defect in the grade must be corrected by taking up and relaying the blocks.

After proper ramming, the entire gutter will be thoroughly grouted with a thin, easily flowing grout of neat Portland cement.

A similar construction of block to that described for the gutters may be used adjacent to railroad tracks; the base will in that case extend to the bottom of the cross-ties, or be at least 6 inches thick.

The blocks will be furnished the contractor at the district property yards, and must be hauled to the work at his expense.

A NEW ENTERPRISE.

Articles have been filed for the incorporation of the Cement Wall & Roof Company of Los Angeles, Cal.

A site for the manufactory has been selected on the river front, near the Arroyo Seco, where the raw materials are found in abundance, and where a spur of the Salt Lake Railroad affords facilities for getting out the finished product. The machinery and molds have been ordered and within a short time the plant will be in full operation.

The capital, $250,000, and its affairs will be managed by a board of directors consisting of F. R. Yerxa, Carlyle C. Davis, General Johnstone Jones, Cabet A. Yerxa and Harry C. Yerxa. After the industry is fully established here, similar plants will be located at San Francisco and other California points.

The Cement Machinery Co. of Jackson, Mich., will open a branch office at 29 Broadway, New York.

FIRST CONCRETE APARTMENT HOUSE.

Samuel Trood, president of the Cathedral Parkway Realty Co., has completed two 6-story elevator apartment houses at Nos. 616 to 628 West 137th street, between Riverside Drive and Broadway, city of New York, the walls of which are made of concrete. Concrete was selected on account of the high price of brick at the time the builder was ready to begin operations. The building department approved the plans and work was begun, when a delegate from the Bricklayers' Union objected to the concrete men doing the work on the ground that it belonged to the bricklayers. The pay of the concrete men was 30 cents an hour, while the bricklayers received 70 cents per hour. The owner refused their demand and employed concrete men. After the fifth story had been reached the Tenement House Department ordered the work stopped, as the law said that tenement houses over three stories in height must be built with brick, together with the staircase enclosure. A compromise was finally reached by building an 8-inch brick wall around the entire staircase enclosure. The concrete walls have several times the strength of brick, are monolithic and constitute the best fire-proof building material known. By the use of concrete every apartment is made absolutely sound proof, so that quiet and privacy are assured. These houses have four families on a floor, divided by four, six and seven-room apartments, having all modern improvements, the rents of which range from $10 to $15 a room per month.—Record and Guide.

The U. S. Geological Survey has published its annual mineral chart showing the mineral products of the country for the years 1896 to 1905. The total value of the country's mineral products in 1905 was $1,623,877,127, as compared with a value of $1,360,883,554 in 1904. Of this total, $921,024,019 represented the value of the non-metallic products and $702,453,108 that of the metallic products, while $400,000 is allowed for the value of unspecified products such as nitrate of soda, carbonate of soda, sulphate of soda, and alum clays used by paper manufacturers, bismuth, molybdenum, nickel, cobalt, titanium, tungsten, and lead not included under lead.

A table of total mineral products from 1880 to 1905 shows that their value has increased in 25 years from $364,928,298 to $1,623,877,127.

The Overton estate is constructing an 8-foot concrete sewer 1,700 feet long, at Memphis, Tenn.

PRIZES FOR CEMENT HOUSE PLANS

The Garden City Company of Garden City, Long Island, Nassau County, N. Y., has awarded $4,000 for plans and specifications for cement houses. The company controls 2,000 acres near Hempsted on the Long Island Railway, 15 miles beyond Brooklyn, upon which it will erect cement houses, until the entire tract is built over and sold. The plans called for several different types, single dwelling to be erected on 77-foot front lots, the buildings to cost not more than $7,000 each.

Double houses are to cost not more than $12,500 each. The first prize of $1,000 was awarded to J. Lovell Little, architect, of Boston, for the best plan for single houses.

The first prize of $1,000 for double houses to be built on lots 143 feet wide was awarded to Aymar Embury, architect, of New York City. The cellar walls for single houses being either stone or concrete; the cellar walls for the double houses being built of cement blocks. The frame in both classes being wood with cement plastered walls inside and out, laid on expanded metal. Some 600 or more cement houses are to be erected on this tract sooner or later, as the demand may justify. Two second class prizes of $500 each and ten prizes of $100 each were likewise awarded. Some ninety plans were submitted in the competition.

FROM MARL TO ROCK.

The Great Northern Portland Cement Company had about completed arrangements for converting its plant from marl to rock, when a receiver was appointed to take over the works. The company having purchased lime stone deposits at Petoskey, Mich., new machinery was installed and everything in shape to abandon the marl system. We understand that the receiver will continue to operate the plant during the pending litigation, in which the company's affairs are involved; that a mixture of rock and marl will be used in the manufacture of cement by the receiver. A number of the Michigan mills are now using a percentage of lime rock with marl in order to obtain a greater kiln output, as a much dryer raw cement floor can thus be obtained than with a marl and clay mixture. The trouble with marl is that it occupies too much bulk in the kiln. This, with the high percentage of water in the slurry, restricts the output. It is a well established fact that the greater the density of the raw material the greater the output per kiln. The marl lies in kiln in a fluffy condition, occupying more space than the denser rock powder. The change from marl to rock is therefore desirable.

THE DEWEY PORTLAND CEMENT COMPANY.

The Dewey Portland Cement Company was incorporated recently under the laws of West Virginia and has already commenced the erection of a 2,500-barrel plant at Dewey, Okla. The site at Dewey was selected as at that point is found an abundance of gas, fine quarries of rock and shale, combined with exceptional shipping facilities.

Electric power will be used throughout the plant and will be furnished from three-phase electric generators direct connected to four 600 horse-power engines. About 50 motors, aggregating 2,500 horse-power, will be used, it being the purpose of the company to drive each and every important machine or apparatus by an individual motor. Thus in case of a breakdown only one machine will be out of commission and the production of the plant held at the maximum.

The main buildings will be steel and concrete, and will house a plant equipped with the latest and best equipment. Every detail, mechanical and electrical, will be the result of the most skillful design and engineering skill, being compact and strong throughout, reliable, and as nearly indestructible as possible.

Contracts are now being let for the cement machinery, the buildings, power equipment and crushing machinery having already been purchased.

Work is being pushed on the plant and it is expected that it will be in operation by the early summer.

The officers of the company are F. E. Tyler, president and general manager; F. L. Williamson, vice president; J. H. Kieth, secretary; J. R. Mulvane, treasurer; C. M. Ball, assistant treasurer.

The main office of the company is at Coffeyville, Kansas, I. O. O. F. Building.

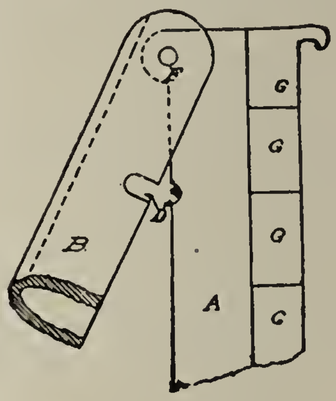
The Miracle Pressed Stone Company recently received a very nice indorsement for their sewer pipe molds from far-away Russia. On September 1 they received an order from Bodo Egestorff of St. Petersburg, Russia, for 10 and 12-inch sewer pipe molds. Mr. Egestorff wrote at that time if they were satisfactory he would want more of the various sizes.

On December 14 they received another letter from Mr. Egestorff enclosing a large order for various sizes and stating that he had received the first shipment and was very much pleased with the same.

The Miracles state they now have customers on their books from practically every civilized country in the world, and that they recently sold one of their Exhibit "A's" to the English Government.

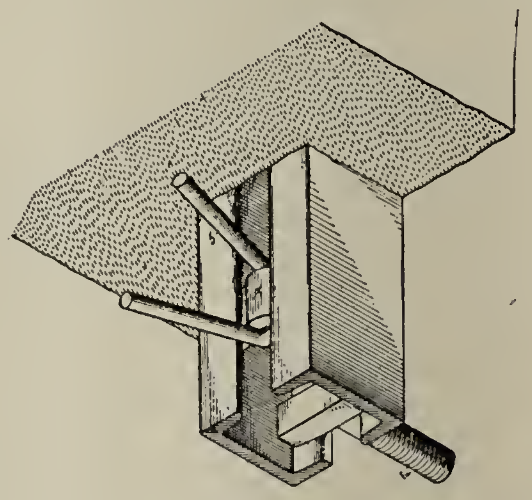
827,224. Cement Post for Wire Fences. Orin Fleming, New Sharon, Iowa. Filed Oct. 19, 1905. Serial No. 283,538.

Claim.—The combination of a post having a T-shaped cross section and provided with a cement foot at bottom with a rib or brace in middle of post resting on this foot and so shaped as to form a pocket or hollow above the foot; a clamping plate with inner arm securely molded in the post and having on outer edge half-circle notches forming a seat for the wire, the outer arm of the plate U-shaped and joined to inner arm by a bolt hinge at the top and adapted to press upon the wire at either side of the inner arm forcing the wire into the receiving notches and making an abrupt bend on either side to prevent wire from slipping or moving up and down; a fastening device for adjustably securing the clamping plate to the post and a copper wire running from clamping plate to moist earth to form a lightning conductor.



827,613. Anchorage for Concrete Structures. James A. Brown, Philadelphia, Pa. Filed Jan. 16, 1905. Serial No. 241,284.

Claim.—1. The combination of a concrete structure with an anchoring device embedded therein and consisting of a channel bar structure with flanged and slotted front portion for engaging a headed bolt, and stirrups engaging the rear portion of said structure and presenting diverging fingers which project into the concrete, substantially as specified.



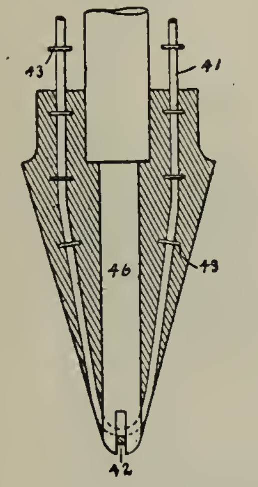
3. The combination of a concrete structure with an anchoring device embedded therein and having stirrups each consisting of a bar or plate hav-

ing a bearing upon said anchoring structure and provided with integral fingers bent up therefrom so as to project into the mass of concrete beyond the anchoring device, substantially as specified.

827,286. Magnesia Cement. Ernst Bidtel, Hoboken, N. J., assignor, by direct and mesne assignments, to American Hydrolit Company, Hoboken, N. J., a corporation of New Jersey. Filed Nov. 11, 1904. Serial No. 232,359.

Claim.—1. The combination of substantially thirty-six parts by weight of sawdust, eighty-five parts of magnesium chlorid solution (36.8 deg. Baume) and twenty-five parts of infusorial earth, forming a substantially dry ingredient of magnesium cement.

2. The herein described composition of matter, which consists substantially of thirty-six parts by weight of an absorbent filler, eighty-five parts of magnesium chlorid solution (36.8 deg. Baume), twenty-five parts infusorial earth, seventy-five parts pulverized burnt magnesite, and forty-three and one-half parts water.



827,535. Concrete Pile. Julius Kahn, Detroit, Mich., assignor to Trussed Concrete Steel Company, Detroit, Mich., a corporation of Michigan. Filed Sept. 22, 1905. Serial No. 279,585.

Claim.—1. In a pile, the combination of the body thereof formed of plastic material and having a longitudinal bore, of a series of rings molded in said body concentric with the bore, a series of longitudinally extending tension members, said body portion formed with a tapering point, crossed metal bars embedded in the material of the point, a removable metal core adapted to engage the crossed metal bars, and an elastic pad on the upper end of the pile.

2. In a pile, the combination of the body thereof formed of plastic material and having a longitudinal bore and a tapering point, the diameter of the body next to the point being of less diameter than that of the upper portion of the point, crossed metal bars united with the plastic material of said point and having a series of projections, and a metal core adapted to transmit the force of blows received at the upper end to said crossed metal bars.

MINING DIAMONDS.

Mr. Gardner F. Williams, general manager of the De Beers diamond mines, delivered an address before the National Geographical Society of Great Britain on the mining and recovery of diamonds at the De Beers mines, from which we abstract the following:

The diamonds exist in a hard, blue ground which millions of years ago gushed up from the interior of the earth and filled the throats of volcanoes.

Thousands of tons of this blue ground are brought up daily from a depth of more than 1,000 feet and spread over floors. These floors are made by removing the bush and grass from fairly level stretches of ground. After clearing the face of the ground it is hardened and smoothed with heavy rollers until it is fit for use.

After the blue ground has been spread out, it is necessary to wait patiently until the sun and rain have disintegrated the breccia. The effect of the exposure of this curious compound to heat and moisture is very remarkable. Large pieces of blue which are as hard as sandstone when freshly taken from the mine, soon begin to crumble on the depositing floors. To hasten the disintegration the bed of blue is harrowed several times to turn up the bigger lumps and expose fresh faces of the ground to the sun. Spans of mules were formerly used to drag the light harrows. Steam traction engines are now employed to draw wheeled harrows with huge teeth back and forth across the floors. The great area of the floors looks like some vast plowed farm where the laborers are preparing the soil for seed.

The diamonds are invisible. During the fifteen years of my charge of the De Beers mines I have never found a diamond on the floors.

Under normal conditions soft blue ground becomes sufficiently pulverized in from four to six months, but it is better to expose it for a longer period, even for a whole year.

The ground is then carried in automatic trucks to the washing machines, where it is mixed with water to a very thin mud and passed through a series of pans and screens. Fifty per cent of De Beers ground, when well pulverized, will pass through a screen with holes one-sixteenth of an inch square.

When the day's work is completed the pans, through each of which 300 loads have passed, are emptied or "cleaned up" and the concentrated deposits of diamonds mingled with other heavy but valueless minerals, are then sent to the pulsator, which separates the diamonds sufficiently for the sorting tables.

The work of picking out the diamonds by hand from the concentrate on the sorting tables was, of course, necessarily slow and tedious. It was the only division of diamond mining and winning which seemed beyond the application of machinery.

A series of experiments was commenced with the object of separating the diamonds from the heavy, valueless concentrates. An ordinary shaking or percussion table was constructed, and other known means of separation were tried without success. One of the employes, Mr. Fred Kirsten, in charge of the experimenting.

Notwithstanding the fact that the specific gravity of the diamond (3-52) was less than that of several minerals associated with it, so that its separation would seem a simple matter, it was found in practice to be impossible, owing to the slippery nature of the diamond. The heavy concentrates carried diamonds, and diamonds flowed away from the percussion tables with the tailings. When it seemed that every resource to do away with sorting had been exhausted, Mr. Kirsten devised a new scheme by coating the surface of the percussion table with grease, having previously noticed that oily substances, such as axle grease and white or red lead, adhered to diamonds when they chanced to come into contact, and he argued to himself that if these substances adhered to diamonds and not to other minerals in the concentrates, why should not diamonds adhere to grease on the table and other minerals flow away? In this way the remarkable discovery was made that diamonds alone of all minerals contained in the blue ground will adhere to grease, and that all others flow away as tailings over the end of the percussion table with the water. After this was determined by thorough experiments, more suitable shaking tables were constructed at the company's workshops. These were from time to time improved upon until now all the sorting except for the very coarse size is done by these machines, whose power of distinction is far superior to the keenest eye of the native. Since the discovery of the affinity of grease for diamonds, experiments have been made with rubies and sapphires from Burma, and it was found that grease caught these gems with the same certainty that it catches diamonds.

After a thorough trial a number of these unique diamond-catching tables were constructed, and are now working on De Beers concentrates. Each shaking table is made of corrugated cast-iron plates in five sections, with a drop of about an inch from one division to another. Thick grease is spread on the plates to cover them to the top of the corrugations.

Strange to relate, the descending diamonds stick on the face of the grease, while all other minerals pass over it. Only about one-third of one per cent of diamonds is lost by the first table, and these are discovered almost to a stone when the concentrates are passed over the second table. The discrimination of this sorter is surely marvelous. Native workers, although experienced in the handling of diamonds, often pick out small crystals of zircon or Dutch boart by mistake, but the senseless machine is practically unerring. It will catch rubies, sapphires, and emeralds as well as diamonds, but, so far as it has been tested, it will not cling to anything but a precious stone. The grease which is used loses its power to catch diamonds after a few hours' work, owing to its becoming more or less mixed with particles of water. It is then scraped off the tables, together with the diamonds adhering to it, placed in a kettle made of finely perforated steel plates, and steamed. The grease passes away to tanks of water, where it is cooled and is again fit for use.

Formerly of 12,000 loads, which is about the daily average of the quantity washed at De Beers and Kimberley mines, 160 cubic feet had to be assorted by hand.

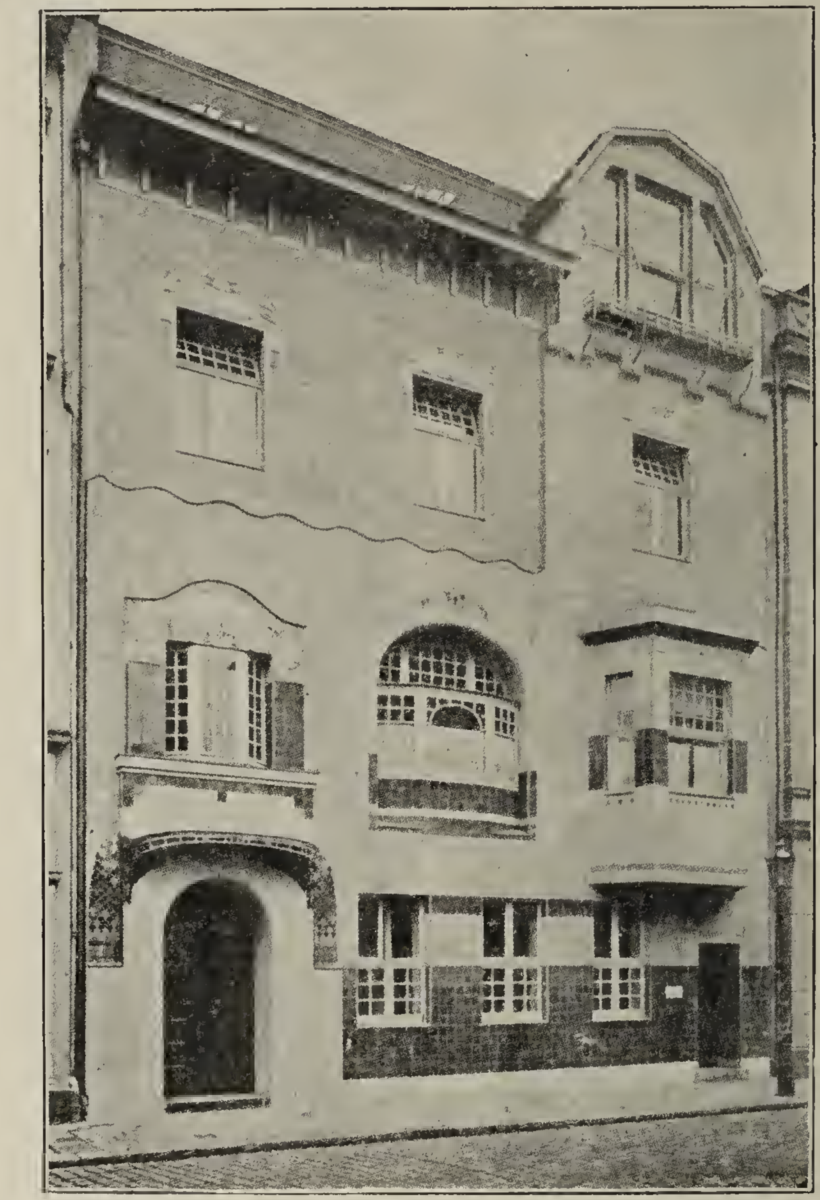
When the stones are cleaned they are carefully assorted with reference to size, color, and purity, and made up in parcels for sale. For several years past the De Beers Company has sold in advance its annual production to a syndicate of London diamond merchants, who have representatives residing in Kimberley.

When the bare statement is made that nearly 5,000,000 truck loads, or more than 4,000,000 tons, of blue ground have been washed in a year, the mind only faintly conceives the prodigious size of the mass that is annually drawn from the old craters, and laboriously washed and sorted for the sake of a few bucketfuls of diamonds. It would form a cube of more than 430 feet, or a block larger than any cathedral in the world, and overtopping the spire of St. Paul's while a box with sides measuring 2 feet 9 inches would hold the gems.

Diamonds are so highly prized and so imperishable that the amount of these gems in existence may almost be reckoned as the total of the world's production, ranging in value through hundreds of millions of dollars. Mr. Kunz does not estimate a loss of 5 per cent in 100 years, and the South African diamond fields alone have contributed over $400,000,000 in value to the world's stock. Yet the demand increases apace with the world's growth in wealth, and no diversion of the world's fancy is apparent.

A CEMENT PLASTER RESIDENCE AT DUSSELDORF, GERMANY.

The cement plastered dwelling house herewith illustrated was erected for Dr. Petermann, after plans by Architect Richard Bauer of Dusseldorf. The plan is unique, particularly as shown by the lambrequin effect in the third story. The entire front is in good taste with the least amount of ornamentation. The lower half of the first story, between the main and side entrances, is covered with small colored square glass tiles. The small arch over the main entrance is likewise covered with these glass tiles in several colors.



Cement Finish Dwelling.

FIREPROOF SOAPSTONE PAINT.

Soapstone reduced to a fine powder has been used for over 20 years as a base for fireproof paint. This is mixed with a quick drying varnish or boiled linseed oil, and produces a high grade fire-resisting paint, which is extensively used for painting cars, iron roofs, doors and shutters and structural steel. It not only resists high temperatures but likewise the action of acids and gases. It can be used on wood with good results.

It is one of the best and cheapest paints that can be used for painting concrete. It adheres well and still is not affected by frost. Ground soapstone sells at about $10 per ton in carlots.

THIRD ANNUAL CONVENTION OF THE IOWA ASSOCIATION OF CEMENT USERS.

At a recent meeting of the officers of the association in Des Moines it was decided to hold the third annual convention at the Iowa State College the last week of January. It is believed this will be an especially satisfactory date for the meeting, following as it does the national convention in Chicago and the Northwestern in Minneapolis.

Strong effort is now being made to arrange a program and for special features that will be ahead of anything attempted in preceding years. The uses of cement are becoming more varied and the numerous phases will be presented in discussions and in papers by specialists along the different lines.

As in former years, the exhibits of cements, cement products and cement-using machinery will be a feature of the meeting. Space for such exhibits is to be provided without charge in the convention hall. Exhibitors who wish to operate their machines will be allotted suitable space in the new college forge shop located near the convention building.

It is planned to have prepared a series of standard sands with which those in actual use may be compared. Those attending the convention are urged to bring samples of both the raw materials and finished products for comparison and display.

Practical methods of testing the setting of cements, breaking strength and other properties will likewise be demonstrated at the convention.

It is the aim of the executive committee to plan this winter's meeting so as to include features of interest to engineers, architects, contractors, sidewalk men, as well as manufacturers of cement goods, cement-using machinery and of cement itself. The cooperation of all persons interested in cement and its uses is asked to make the coming convention a grand success.

Arrangements are being made for the usual reduced rates on railroads and for the satisfactory entertainment of visitors during the convention days. A larger number will be accommodated on and near the college campus than in former years.

Requests for information regarding the convention, reservation of space for exhibits, or hotel accommodations, may be addressed to the secretary, Iowa Association of Cement Users, Ames, Iowa.

ROTARY KILN FIRING INVENTION.

A practical cement burner employed in one of the Illinois cement mills, has invented a new process of cement burning in the rotary kiln, whereby combustion can be made to take place in any part of the kiln irrespective of the length of the kiln, either simultaneously or intermittingly, apart from the regular finishing in the heat zone. The object being to obtain a larger output with less fuel. The inventor would like the opinion of cement experts or chemists on this subject through the columns of the Cement and Engineering News.

SUBSCRIBER.

The Diamond Portland Cement Co., Cleveland, Ohio, is sending out a handsome pocket diary for 1907, leather bound, with the usual data and statistics found in first class diaries,, including maps of the various states and our insular possessions, the difference in time between the leading cities of the world, population of the leading cities of the U. S., value of foreign coins, weather bureau signals, antidotes for poisons, etc.

THE JORDAHL SYSTEM OF REINFORCED BEAM AND FLOOR CONSTRUCTION.

Under this system floors, beams and girders may be constructed in reinforced concrete, using either cinder, crushed stone or sand and gravel concrete to secure the desired fire-proofing properties. Briefly, the floor is constructed as follows:

Bottom flange blocks E, Fig. 1, which are moulded in advance, are erected first. These blocks are recessed away on one side, and reinforced with two straight bars and one bent one, which forms a loop "d" in the middle, projecting above the top of the blocks on the side which is recessed away. The blocks are firmly secured to the steel beams or girders by driving a short steel bar "e" through the loop, so that one end of the bar enters the top of the bottom flange of the steel beam or girder, and the other end is supported by a short piece of band iron "f," Fig. 2, which rests on top of the block itself. Cement grout is now filled in spaces "g" and "h," thus embedding bar "e," plate "f," and the looped bar "d."

Blocks D, Fig. 1, which are also moulded in advance, are now placed on top of blocks E, as shown. The wooden centering, Fig. 3, for the floor slap is erected next. It consists of timbers "a" placed on edge on top of wedges "c," which are supported by the blocks E, Fig. 1. The centering boards "b" for the concrete floor slabs are now placed on top of timbers "a." Intermediate supports for boards "b" are provided between the floor beams where required. The reinforcing metal for the floor slab is now put in place, and the concrete for same deposited on top of centering. The wooden centering may be easily removed by first removing wedges "c."

For floors requiring a flat ceiling, Fig. 3, cement ceiling slabs F are moulded in advance. In them, small tee-irons are embedded, to the bottom of which a wire netting is tied. The tee-irons have their ends bent up to a bevel, which, when the ceiling slab is put in place, rests against the sloping sides of blocks E.

This floor system has been designed with the object of providing a floor in which the bottom flanges of the

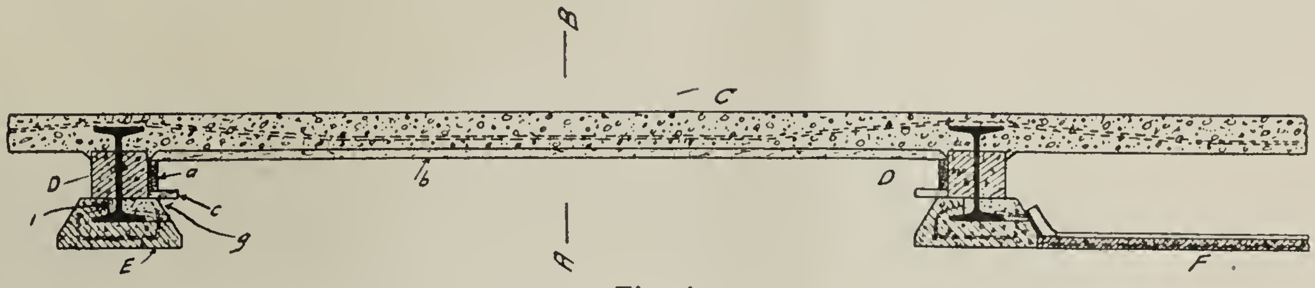
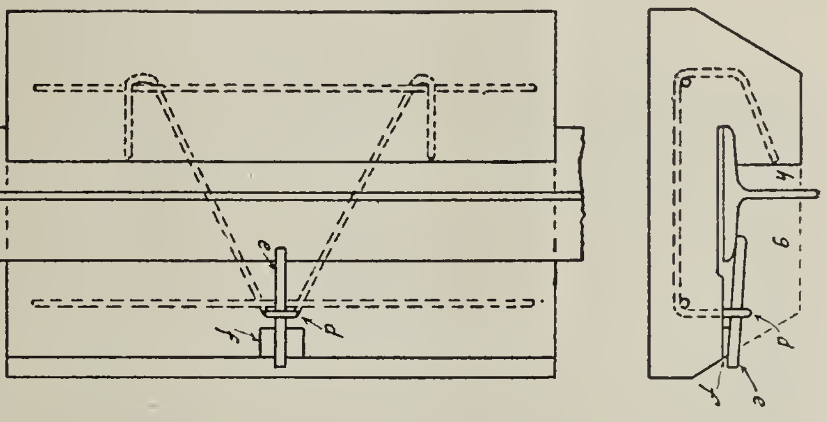


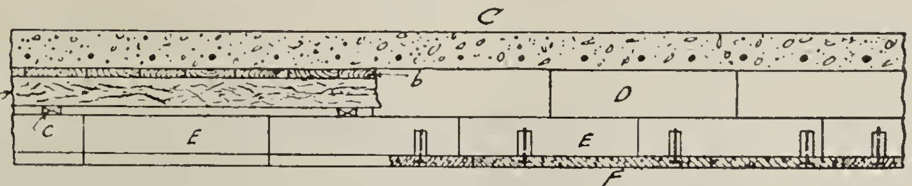
Fig. 1.



Detail of Bottom Flange Casing

Scale: 3" = 1 ft.

Fig. 2.



Section A-B.

Wooden centering shown removed in right hand part of view and suspended ceiling construction shown

KEY:

▨ Concrete poured or tamped in place

▨ Concrete block or slab manufactured previous to erection

▨ Cement mortar tamped in place.

Fig. 3.

beams and girders are effectively protected against fire. Recent conflagrations have proved that it is not sufficient to rely on a thin coat of plaster, a piece of tile or a suspended ceiling for the protection of the most vital and the most exposed part of the floor system.

The wooden centering is extremely simple, and thus reduces to a minimum the amount of skilled carpenter work necessary to construct same. The amount of lumber required is also considerably less than is usual in this class of construction. Blocks E and D can be manufactured by common labor.

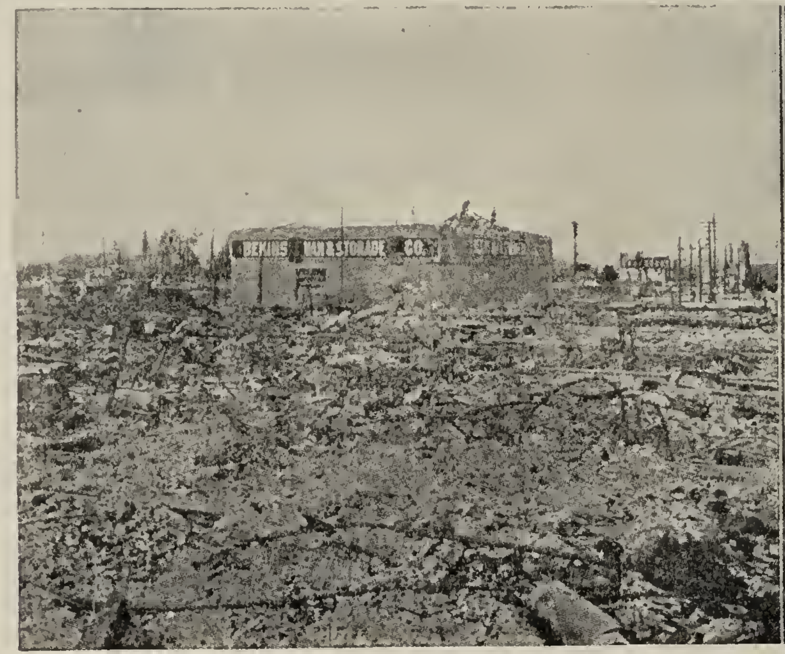
A U. S. patent has recently been granted on this floor system to A. Jordahl, care of The Reinforced Cement Construction Co., 1 Madison Ave., New York City.

THE LARGEST POWER GAS PLANT IN THE WORLD.

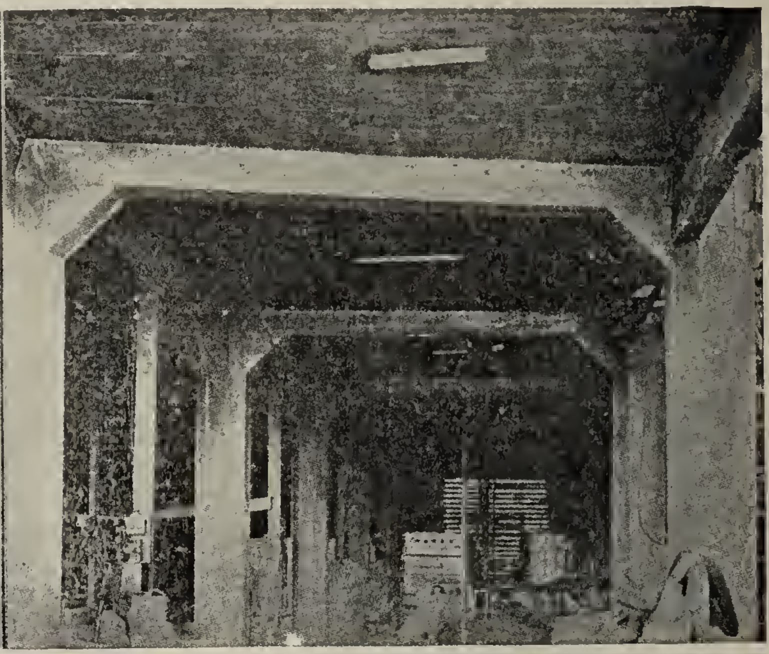
The Iola Portland Cement Company is installing the largest power gas plant in the world, at its new Dallas plant. The Loomis-Pettibone gas generating system will be used, built by the Power Machinery Company, divided into three units having a total capacity of 4,500 H. P. The gas-making fuel will be bituminous coal and Texas lignite. Either fuel can be used without change in the apparatus. The resultant gas is guaranteed to be fixed, clean and suitable for use in gas engines. The Snow Steam Pump Co. of Buffalo will furnish four gas engines, each with a normal cacapacity of 1,100 H. P. These engines will be directly connected to alternating-current 25-cycle electrical generators, each of 810 K. W. capacity, and will operate in parallel, continous operation 24 hours per day, seven days per week, being required. The builders of the power apparatus guarantee 1 kilowatt per hour at the switchboard, from one and one-half to one and three-fourths pounds of bituminous coal, or from two and one-half pounds of lignite.

THE BEKINS VAN AND STORAGE CO. BUILDING.

The Bekins Building on West Mission street, San Francisco, built after the Kahn system of reinforced concrete construction, was finished up to the third story at the time of the earthquake, the curtain walls being brick. The concrete portion passed through the full force of the earthquake and showed no damage except in the brick curtain walls. An interior and exterior view of the building is shown. The brick walls were somewhat cracked. Here brick and concrete were tested side by side in the same building, with results as above stated.



Exterior View of Bekins Building.



Interior View of Bekins Building.

CEMENT TESTS IN WASHINGTON, D. C.

The report of J. O. Hargrove, Inspector of Asphalt and Cement to the Engineering Commission of the District of Columbia, shows that 1,300 barrels of natural cement were received and 130 samples tested, of which none were rejected. Residue on 100 mesh sieve, 6.7; initial set, 48 minutes; water used in neat cement, 31.2; temperature of air and water, 81 F.; tensile strength per sq. in. 1 day, 199 pounds; 7 days, 298 pounds water used. Cement, 2 parts; sand, 13.6 per cent; tensile strength in 7 days, 298.

Portland Cement—19,186 samples, representing 186,344 barrels, were tested, of which 179,894 were passed as satisfactory.

The cost of laying cement walks in Washington has increased from 99 cents per square yard in 1905 to $1.13 per square yard in 1906, due to increase in wages and the enforcement of the eight-hour law, as well as the higher price of cement. While this class of work is now being done by day labor by the Engineering Commission of the District of Columbia, who prefer the contract system, believing that the work could be done for less money than by day labor.

LARGER QUARTERS FOR THE IDEAL CONCRETE MACHINERY CO.

Ideal Concrete Machinery Co. of South Bend, Ind., removed from its present quarters to the Bissell Plow Works, upon which it has secured a long lease, the old quarters having become too small for its rapidly increasing business. The present factory has an area of 16,000 square feet, which in two years it has outgrown. The new factory will have 60,000 square feet of floor space with plenty of room for enlargement, all of which we are pleased to know. The company has just placed an order for 55,000 new catalogues.

We illustrate a German Portland cement plastered villa erected at Heikendorf, near Kiel, Germany. The cement mortar was laid onto expanded metal lath. The building was designed by Otto March, architect. The floor plan shows an entrance hall, living room, dining room, two servants' rooms, smoking room and kitchen. The villa has a decided American appearance.

The Thames tunnel, built in 1828, is the first important engineering work in which Portland cement was used. Portland cement has therefore been on the market for the last 78 years as a material used in engineering construction. The price at the works was $5 per barrel. Its manufacture in the early days was on the happy go lucky system.

The Elk Cement & Lime Co. will increase the capacity of its plant to 1,200 barrels per day for next season's run.

REINFORCED CONCRETE IN NEW ZEALAND.

Reinforced Concrete Wharf, Auckland, N. Z.

The New Zealand Government Harbor Board at Auckland has completed a reinforced concrete railway wharf, two views of this wharf being shown in our illustrations The Government owns much of the water front at the principal ports, as well as the dry docks, all managed by twenty-six local harbor boards. The Government likewise owns the railways and even the seaside amusement parks or watering places.

The Auckland concrete wharf was built by the Ferro Concrete Company of Australia, Limited, W. A. Robertson, manager. The work was done for the local Auckland Harbor Board. The concrete structure is protected by timber fenders. Several other ports have reinforced concrete wharfs.

One of the oldest concrete structures in New Zealand is the concrete Beacon at Rangitoto at the entrance of Auckland harbor, built in 1886, the Wilson Star brand of Portland cement being used. This cement is manufactured at Warkworth, Auckland, New Zealand, by John Wilson & Co. Our illustration shows the structure as it stands to-day, after 20 years' service.

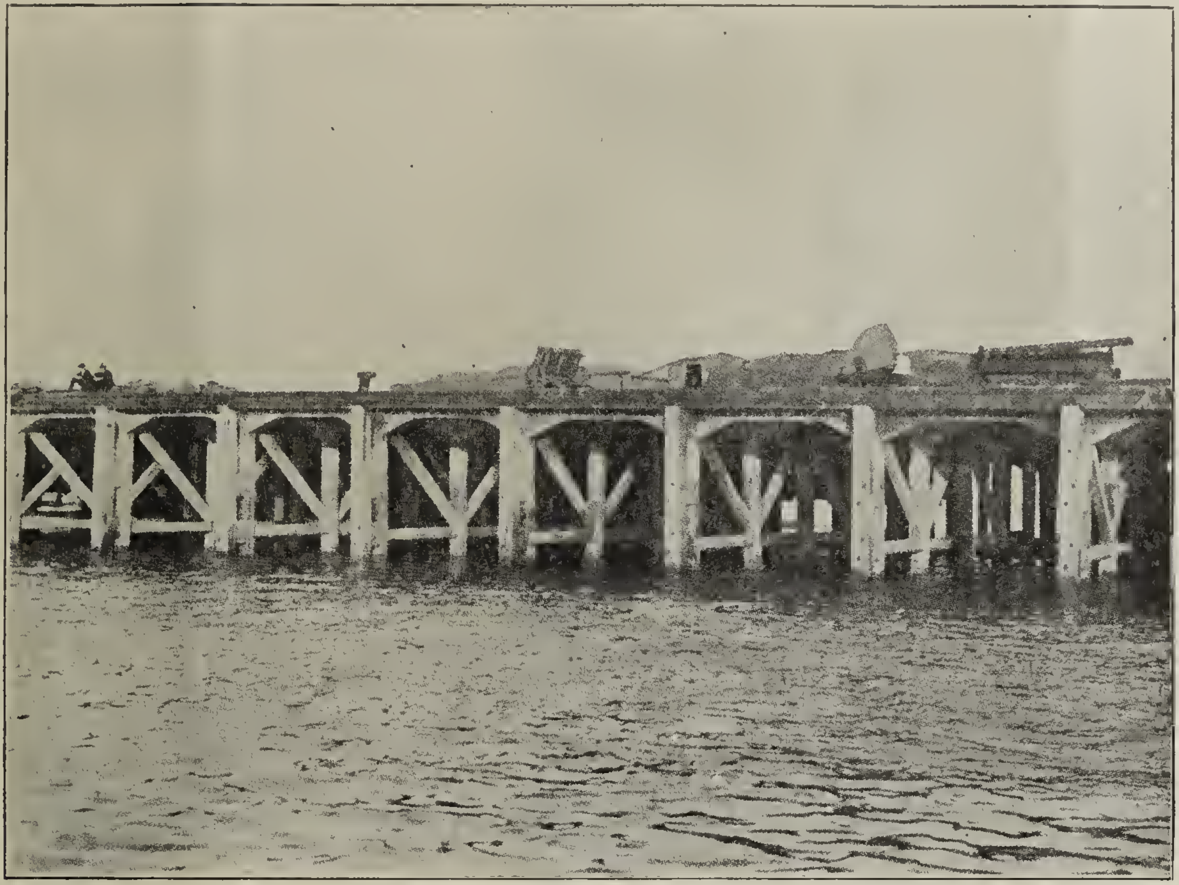


Fig. 1, Front Elevation.

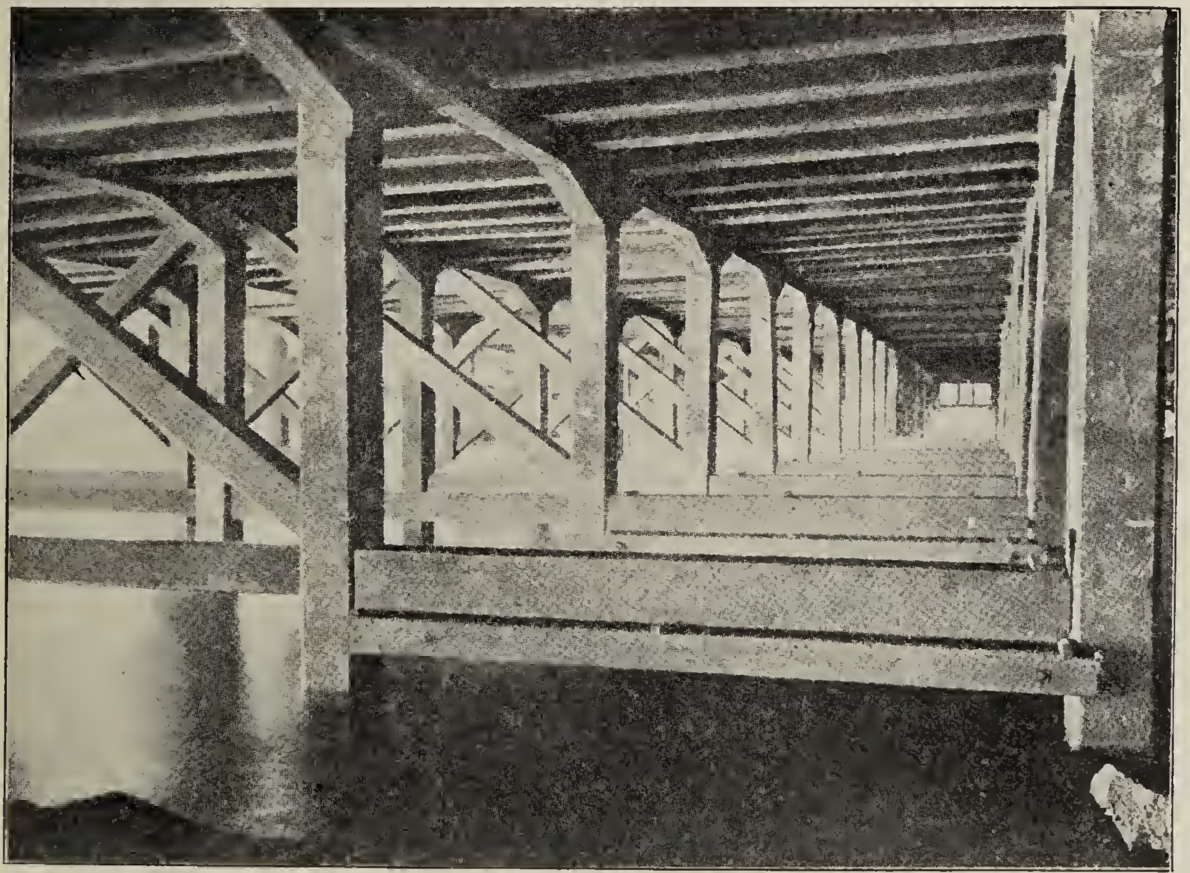


Fig. 2, Piles, Braces and Dock Beams.

BANKRUPTCY PETITION.

A petition that the Cement Products Company of Rochester, N. Y., be declared bankrupt was filed December 13 with the U. S. Court. The creditors making the application have claims against the company aggregating $6,600.

The Perkins Portland Cement Co., of Salt Lake City Utah, has been incorporated. Capital, $500,000, in shares of $1.00 each. The officers are as follows: Walter K. Perkins, president; E. D. Hashimoto, vice-president; Heber M. Wells, treasurer; J. M. Bowman, secretary.

Concrete Beacon Rangiloto Built in 1886.

GOOD CONCRETE AND BAD.

Concrete is a good thing. It has come to stay. It will provide the small wage earner with a home at moderate cost, if the trade unions do not raise the price of labor unduly. It will equally well allow large structures to be built speedily and durably. A well built house of concrete is one single stone hollowed out, so to speak, to make separate rooms. To combine the materials is no secret art, but the strength of the building lies in the strictest attention to the simple rules of the trade.

Striking illustrations of the difference between good and bad concrete come from widely separated regions. In Massachusetts a tall chimney of concrete collapsed in a gale. An examination proved that it was the first concrete construction of an amateur. The materials were not properly mixed and pieces of concrete crumbled in the hand. The reinforcing steel was bright and clean, showing that the concrete had not adhered at all. But in Minnesota a five-story grocery warehouse has been built without beams. The solid concrete floors have been tested to a weight of 750 pounds to the square foot. The saving in cost of this building by omitting the usual mill construction is over $10,000. The concrete was made right.

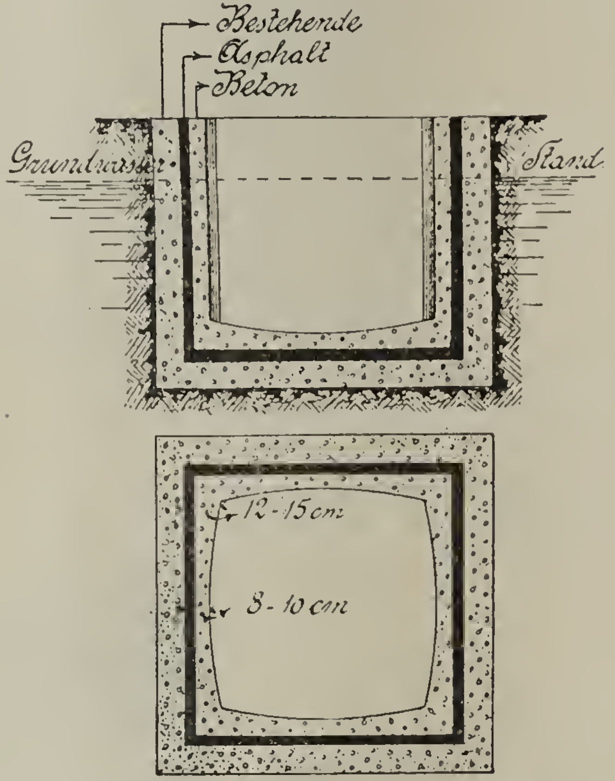
In California a new hotel of concrete collapsed with injury to persons and property. In Tunis a six-story warehouse was built of concrete. It has appeared since that the earth under one side of the building was not solid and the building has listed until the top is ten feet out of perpendicular. Not a crack has appeared in floors or walls and engineers are at work jacking up the building to restore it to perpendicular and make the foundation more secure.

These examples plainly show that well made concrete is safe and substantial. A concrete house properly made may not be upon a rock, but it is a rock. A concrete house badly made may not be builded on the sand, but it is sand, as unsubstantial as the houses that children build on a summer day by the sea shore. Inexperienced builders should not trust their native intuition to teach them the way to mix concrete, and the report of occasional collapses should not be allowed to diminish the regard in which the material is coming to be held. In every case of accident the builder can probably be shown to be in fault. One more addition has been permanently made to the list of accepted building materials.—Chicago Tribune.

CONCRETE WATERPROOF ELEVATOR WELL.

It is difficult to make ordinary concrete waterproof, especially where crushed stone is used, sand and gravel being much more satisfactory.

We illustrate an elevator well or pit in which the waterproofing was accomplished by asphalt between the inner and outer walls of concrete; the concrete walls are about 8 inches thick with a 2-inch layer of asphalt between. We believe the above plan could be improved, as the water in the soil reaches within 1 foot of the top. This will tend to lift the entire tank or pit. This can be overcome by making the base wider, say one foot all round, and taper to the top. The earth will then hold the concrete in place. A good water-tight cement tank or pit set in the ground can be made by packing a six-inch space with soft clay free from sand around the sides and bottom. The clay must be well packed in order to insure success.



The North American Portland Cement Co., which is being financed by six of the large Lehigh cement companies, is to erect six new plants in various parts of the country. Options are now said to be held on land in Kansas, Iowa, Illinois, Indiana, California and Pennsylvania. Each plant is to take the name of one of the plants financing the parent company.

CEMENT VS. STEEL.

(Iron Trade Review.)

The finished products of the iron and steel industry in the current year can be closely estimated. The production of pig iron will probably be slightly over 25,000,000 tons, and an output of 25,000,000 tons of finished products would be distributed about as follows, the rolled forms including both iron and steel:

	Gross tons.
Rails	3,700,000
Plates and sheets	4,000,000
Wire rods	1,900,000
Structural shapes	1,900,000
Bars, hoops, etc.	7,000,000
Iron castings	5,750,000
Steel castings	750,000
Total	25,000,000

Obviously concrete will not replace rails, wire products or steel castings, which cuts 6,350,000 tons out of the reckoning. Of the 1,900,000 tons of structural shapes a considerable proportion goes into steel cars. The balance, with a portion of the plate tonnage, goes into immovable fabricated structures. More than one-fourth, or more than 1,000,000 tons of the 4,000,000 tons of plate and sheet tonnage goes into tin plates, galvanized sheets and black sheets of light gauge. A large proportion of plate tonnage goes into steel cars, and a considerable proportion of the remainder into shipbuilding. Obviously we shall never have concrete ships or concrete cars. Of the total shape and plate tonnage probably less than 2,000,000 tons is vulnerable, and some fraction, possibly not a large one, concrete might be made to replace. Having already thrown out 6,350,000 tons, let concrete be given the whole 2,000,000 tons of plate and shape tonnage, leaving 3,900,000 tons in these branches to be thrown out. Coming next to 7,000,000 tons of merchant mill products, including bars, bands, hoops, etc., it is evident that the growth of concrete would increase rather than diminish the use of such forms. Of the 5,750,000 tons of iron castings it is hard to see that any considerable percentage could possibly be affected by concrete.

Altogether it would appear that of 25,000,000 tons of iron and steel products only about 2,000,000 tons, or 8 per cent, is vulnerable by the growth of concrete.

At a meeting of the directors of the North American Portland Cement Company the following officers were elected: J. R. Maxwell, president; J. B. Wright, secretary; E. M. Young, treasurer; A. F. Gerstell, H. C. Trexler, R. W. Lesley, E. R. Ackerman, H. W. Maxwell and J. B. Lover, vice-presidents.

A CONCRETE CIDER RESERVOIR.

Mr. J. J. Coonee of Claysville, Boone County, Mo., owner of a large apple orchard, found that a large percentage of his apple crop would go to waste on account of the scarcity of cider barrels. Having an old abandoned well on his premises he proceeded to plaster the entire inside and bottom of the well with a heavy coat of cement mortar, the bottom being first filled in above the water line with sand and grover, upon this filling 8 in. of concrete was placed finished with 1 in. Portland cement mortar and the cement mortar lining carried up to the top. A wall of concrete the exact size of the well was built above the ground, the well was then filled up to the top with cider, which is expected to keep as well if not better than if stored in barrels. A wooden cover will be placed over the opening and again covered with a mound of hay or straw as a protection against frost.

THE MARQUETTE CEMENT CO.'S GIFT OF $5,000 TO ITS EMPLOYES.

The Marquette Cement Manufacturing Co. followed its annual custom of distributing to its old employes a certain percentage of the profits of the preceding years and also a cash bonus in the form of a Christmas gift of some $5,000.

This company has always appreciated the justice and value of co-operative methods. Additional enlargements recently arranged will, at an expenditure of some $300,000, yield an output of over 4,000,000 sacks of cement annually. When these improvements are completed it will give the company one of the largest and best equipped Portland cement works in the West.

A circular automobile speedway track, 100 feet wide and three miles long is now under construction at Weybridge, England, on the estate of Mr. Locke-King. The entire course will be paved with Portland cement concrete. A maximum speed of 90 miles an hour will be possible over this track. A club house will be built on the grounds. Races will take place at intervals, unhampered by the restrictions in force on the public highways.

The Sydney Cement Co., of Sydney, Nova Scotia, has secured an order for cement to be shipped to Mexico.

The Early Concrete Stone Co., of Odebolt, Ia., is putting a steam heating outfit in its plant in order to continue operation during the cold weather.

THE HALL OF RECORDS, N. Y. CITY.

The New Hall of Records, located on Broadway, New York city, is possibly the most expensive building in the world. It was commenced about 10 years ago, the land upon which it stands cost $1,841,553. The building itself cost $6,144,613.73, including decorations, furniture and maintenance, while the rent for office quarters paid while the building was under construction brought the cost up to about $10,000,000. The Capitol at Washington cost only $13,000,000. The Congressional Library at Washington, covering acres of ground and regarded as one of the finest buildings in America, cost only $5,746,000. The Exchange Building, the largest office building in the world, thirty-two stories high, with its 900 offices, was ready for occupancy in one year from the laying of its foundations, at a cost of $2,750,000.

The Hall of Records is adorned on its outer walls with symbolic and individual statues. The building is lined throughout with marble. Books move on rollers which require no manual effort to move. Air finely filtered and nicely regulated is sifted into each room by a great air machine in the basement. Water, cooled and filtered ready for drinking, is pumped to every floor.

When a book needs to be carried from one floor to another there is a lift, moved by a push button, to carry it. Office boys sit on $100 chairs. Twenty-five-dollar-a-week clerks sit at $500 desks. Stenographers, with fine marble-lined rooms, are better housed than J. Pierpont Morgan in his office. Room enough for five offices is devoted to one private room of the corporation counsel.

R. P. Davie, J. R. McKinnie, S. R. Bartlett and C. Reyer of Colorado Springs, Colo., and E. B. Skinner, of Independence, Kan., are completing the organization of a company to be known as the Interstate Cement Co., which will erect a plant at Independence, Kan., where 510 acres of land have been purchased. The company is to be capitalized at $3,000,000. R. P. Davis, president; S. R. Bartlett, vice-president; E. B. Skinner, secretary.

The pipe leading to the mains from a gas well on the Wilson farm north of Iola burst on account of the high gas pressure. It took three hours' time to repair the break. The well is owned by the Iola Portland Cement Company.

National Association of Cement Users meets at Chicago January 7 to 12, 1907, inclusive.

HOW A SKYSCRAPER IS PLANNED.

In planning a skyscraper, the architect begins at the top. Otherwise the weight to be carried by the base could not properly be figured. The steel used is mild steel, cast in the form of L's, Z's and I's. The beams come punched with rivet holes, and structural ironworkers then put the parts together. The thing goes like a jumbled-up Chinese block-puzzle. The parts are all there; but it remains to piece them.

The actual handling of the great masses is done with erecting plants, strong hoisting machines and cranes. After the steel is up, the men follow with the "curtain," as the outer walls are called. The masons could begin at one story just as well as at another story. Each floor carries its own weight. The steel skeleton supplies the support. Many ingenious ways are used to distribute the immense weight.

To protect the steel frame against rust, engineers have thought long. Lead, graphite, paint and rubber compositions are used. The opinion among architects is that there is going to be no difficulty about rust. No man now alive, is the prediction, will ever see the big buildings go on account of corrosion of steel skeletons.

The increasing use of cement in tall buildings shows that in the near future New York may even have cement skyscrapers. Plans were filed this week for a reinforced concrete building of 11 stories, to be erected for the McGraw Publishing Co., on the north side of 39th street, between 7th and 8th avenues, from plans from Radcliffe & Kelly, in consultation with Prof. W. H. Burr.

Skyscrapers are in demand because men like to do business in a building in which there are hundreds of other firms. The skyscraper is a world in itself. Drugs, cigar stands, telegraph and cable, baths, restaurants, typewriting offices, mail chutes, hot and cold water, tailors, printers, bankers—are around you. If you wish to have your dinner brought in on a silver platter, you can be accommodated, and there are business men that have a private barber's chair. The men do not care to go to a shop, so have their own, in the big office building.

Men like to be in a place that has the look of prosperity. Mahogany woodwork, swift elevators, marble wainscoting, heavy gilt chandeliers, attendants in uniform and fine housekeeping, make the skyscraper inviting for certain lines of business. The air and light in the upper floors are good; and a man has but to look from his desk to see 15 or 20 miles of open country, forests and river. On its moral side, the sight of the sky and the country is good. It ought to kill foolish pride for a man to find out, as he looks from the window of a 15-story building, over church tops, to distant shores, and down to the liliputians in the parks and streets, that, after all, he is about as important as a fly on a wheel.—Record and Guide.

Portland cement is a very desirable building material in India, where it is used to cover wooden structures against the ravages of insects, especially the white ants, who eat out the heart and core of the wood, leaving only the shell standing. Household furniture is destroyed in the same way. The roofs of houses, usually corrugated iron, are covered with brick dust and cement. Artificial stone is coming into use for entire buildings. Stone is scarce, as is fuel; this makes brick high in price. White sand and gravel is cheap. Therefore cement is the cheapest building material as a rule. There are several cement plants in India operated on a small scale, limestone being scarce. Lime works collect their stone from the field, where it is found scattered like boulders in some portions of our own country. The most common fuel is cow dung which is likewise gathered from the fields where cattle range.

Most of the cement is imported from England.

The fire loss in the United States is two hundred and fifty million dollars per year. The total gold production is only one-third of the fire loss, which is equal to $20 on every American family. This is one substantial reason why buildings should be made fire-proof, which cement construction is doing much to bring about. There were 6,672 lives lost in connection with fires in 1905.

The Simpson Cement Mold Company of Cincinnati, Ohio, $10,000, was incorporated Wednesday by Joseph Simpson, H. G. Simpson, Benjamin L. Simpson, Robert D. Simpson, Victoria Simpson, Bending and Matilda Simpson.

Block & Laird, contractors for the new purification plant of the New Orleans Sewerage & Water Board, have purchased 110,000 barrels of Portland cement from the Carolina Portland Cement Co., distributers of cement in the South.

The International Portland Cement Company's plant near Elizabeth, Pa., was injured by fire. Loss estimated at $200,000. Two three-story buildings were entirely destroyed. The stock house was likewise destroyed.

A new plant to manufacture white Portland cement is to be erected at York, Pa.

INSTRUCTION IN THE USE OF CONCRETE.

The School of Agriculture at the State University of Minnesota has recognized the practicability of concrete in farm construction and has established a course of instruction. The students are taught the proper proportions to mix cement and the best methods of handling it. They are now building cement walks, constructing a cement root cellar and building a cement retaining wall on the experiment station farm. In fencing cement posts are used with a great deal of success to replace the old wooden posts. The construction of these posts will be taken up as soon as the students' work will have to be confined to the house on account of cold weather. In manufacturing these the students are taught to use bits of barbed wire and scrap iron, generally thrown in the scrap pile, to reinforce them. The students will be taught how to make the frame for the construction of cement water tanks, cement watering troughs and cement silos. They will also be shown how to put cement foundations in for stave silos.

Hercules 1907 Catalog is Ready.

The Century Cement Machine Co. of Rochester, N. Y., makers of the Hercules Concrete Block Machine, have just issued a very handsome and profusely illustrated catalogue setting forth the merits of the 1907 Model Hercules and explaining the improvements.

The catalogue will be sent free to readers of this publication. Be sure and ask for Catalogue G.

The Wolcott Portland Cement Co., of Glenwood Springs, Colo., has been organized to erect a plant at Wolcott, Eagle county, Colorado. The raw material will be rock carrying the following analysis:

	Per cent.
Carbonate of lime	60
Silica	25
Alumina	5 to 10
Foreign matter	5 to 10

This material is found in large quantities and can be readily mined.

TO ERECT A CEMENT PLANT.

At the annual meeting of the Imperial Cement Company, at Philadelphia, it was decided to begin the erection of the plant next spring. The company owns several farms at Christian Springs, near Nazareth.

The Capital City Concrete Company, of Springfield, Ill., which was capitalized at $40,000 when organized, is preparing to increase its capital to $150,000. The company is engaged in all kinds of concrete construction work.

DURABILITY OF CONCRETE FLOORS.

BY A. L. A. HIMMELWRIGHT.*

It is necessary to distinguish the different materials as well as the principles involved. The concrete floors, with reference to their fire-resisting qualities, were of three general classes: (1) Segmental arches; (2) short span flat slabs, and (3) reinforced concrete construction.

In the segmental arches the entire cross section of the concrete is in compression, and the strength is entirely independent of light metal tensile elements which invariably weaken in a severe fire test. This type of flooring, with well designed concrete soffit protection, developed the best fire resistance. It was used in the Hotel St. Francis and withstood the earthquake and fire without damage to a single square foot of the large floor area.

The short span flat slab floors, next to the segmental arches, gave the best results. In this form of construction, the slabs are either very thick and without metal elements as in the lower stories of the Spreckels building, or are about 4 in. thick with metal elements incorporated in the concrete. In the best examples of the latter type, the sectional shape of the metal and its position in the slab was largely influenced by a consideration of fire resistance as well as strength. Consequently none of the usual formulæ for reinforced concrete will apply to these methods. When installed in connection with conventional steel designs in which the floor beams were spaced from 5-ft. to 7-ft. centers, this type of floor gave satisfactory results. Normal fires caused no apparent injury either to the concrete or to the metal lath and cement plaster soffit protection. Even under severe conditions, where fires of two to three hours' duration occurred, the soffit protection remained in position and fulfilled its purpose by preventing the permanent deflection of the steel members. The concrete floor slabs, under the same conditions, remained practically uninjured; a thin layer of the material, varying in thickness from ⅛-in. to ¼-in. on the under side, being affected. This amount of the sectional area has no appreciable effect on the strength or efficiency of the slabs.

In the telephone company's main office building on Bush street, portions of which were subjected to a particularly severe fire test of at least two hours' duration, a few of the concrete floor arches of the flat slab type deflected slightly under heavy loads during the fire. These were subsequently tested by uniformly distributed loads of 600 lbs. to the square foot; the loads being of sand in boxes without bottoms. The deflection under this load, of about 1-32 in., is almost identical with deflections under the same load imposed on similar constructions that have not been subjected to fire. This would indicate that the concrete arches retain substantially the same strength as before the fire, and are practically uninjured.

In the case of unusually severe conditions, as in the Kamm building, where fires undoubtedly burned for many days, and where the fireproof floors were subjected to the most severe test in the burned district, the concrete floors were not seriously damaged by the heat. Sections of the first floor, immediately above the basement story, where the intense and long-continued fire occurred, were apparently in good condition, only a thin layer of ½-in. to ¾-in. on the under side of the floor slab being affected by the fire. Had there been no column failures (which caused the wreck of the rear portion of this building), it is probable that the concrete floors throughout would have remained serviceable, and would not have required renewal.

The concrete floors, of both the segmental arch and short span flat type, were in all cases sufficiently strong, both at the time of the earthquake and during the fire, to sustain safes and other heavy bodies. No cases were observed where safes had broken through any of these floors.

Light reinforcing material, such as wire netting, expanded metal, etc., especially when exposed on the under side of the concrete slab, did not show as good results as steel bars of considerable sectional area.

In several cases, concrete of poor quality was originally installed in the work. This fact was determined by an examination of the concrete where it had been subjected to very little or no fire. Even in these cases, when subjected to normal fires, the concrete retains practically all of its original strength.

Both stone and cinder concrete were used in the segmental arch and short span flat slab types of fireproof floors. There was no appreciable difference in the relative fire resistance of the two classes of concrete. It is, however, well known that cinder concrete at high temperature does not disintegrate under the action of a fire stream to the same extent as stone concrete and, for this reason, it is a superior material for fireproof construction. Stone was used exclusively for the aggregates in reinforced concrete work.

The San Francisco Building Code, prior to the fire, did not legalize the construction of entire buildings of reinforced concrete. One building with reinforced concrete columns, girders, beams and floors, and brick walls was in the course of construction. There were, however, a number of buildings that contained reinforced concrete floors consisting of a floor slab, 4-in. to 9-in. in thickness, supported by reinforced concrete beams between steel girders. The principal distinguishing feature of reinforced concrete as compared with the preceding methods is the principle of using light steel rods or bars exclusively in tension and in accordance with rational formulæ. The spans between supports are also generally much greater.

Wherever reinforced concrete floors of this character were subjected to normal fires, such as occurred in office buildings or hotels, the deflection of the reinforced beams was always much greater than that of steel beams of the same carrying capacity.

An interesting demonstration of this fact occurred in the top story of the telephone company's main office on Bush street, where reinforced concrete beams alternated with steel beams at about 7-ft. centers, carrying the same loads and being exposed to the same conditions. This story sustained a severe fire test, a large quantity of combustible supplies being stored in that part of the building in packing cases. The heat generated by this fuel caused the reinforced concrete beams to deflect badly, and one of them to fail. The alternate steel beams, with a soffit protection equal to that under the metal of the reinforced concrete beams and consisting of crimped wire lath and cement plaster 1-in. in thickness, were unaffected and were not permanently deflected.

Injuries and deflections to the reinforced concrete beams caused by fire were also noted in the Monadnock and Marston buildings.

In Johnson & Co.'s building, where a fire of greater intensity and duration occurred, the failure of the reinforced concrete beams was quite general, and no doubt contributed largely to the collapse of the sections of the building that were wrecked.

Reinforced concrete floors of long span suffered similarly, as was shown in the Bekins Van and Storage Co.'s building and the Annex of the Academy of Science, where insignificant fires exposed the reinforcing bars and caused deflections.

In reinforced concrete floor construction the strength is almost wholly dependent upon the light steel tension rods or bars, which economy requires to be imbedded at or near the under surface. In the case of a fire the light metal in this exposed position soon becomes heated, and by expansion and deflection disrupts the thin concrete covering under it. After the steel tensile members are exposed, temperatures of 1,200 deg. F. soon cause failures. Unequal heating while in a high state of stress and strain undoubtedly induced powerful tendencies toward rupture, and may also be a partial explanation of the unsatisfactory behavior of this construction when subjected to normal fires.

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*"The San Francisco Earthquake and Fire." A brief history of the disaster; a presentation of facts and resulting phenomena, with special reference to the efficiency of building materials. By A. L. A. Himmelwright, C. E.

RECENT PROGRESS IN THE CEMENT INDUSTRY.

This subject was discussed in a paper read before the Society of Chemical Industry (London Section) by Mr. Bertram Blount, F. I. C., on June 11th.

The author said that during the last twenty years the cement industry had been undergoing a process of evolution of great importance and significance until at the present time the manufacture of cement was recognized as one of the largest chemical industries. A striking increase in production had been recorded during recent years. In Great Britain the production in 1890 was 1,000,000 tons; in 1902, 2,066,600 tons; in Germany the production in 1890 was 1,525,000 tons, and in 1903, 3,333,300 tons; United States, 1890, 55,830 tons; 1902, 2,871,774 tons; 1904, 4,417,647 tons. This growth has been brought about by several causes, chief among which were the execution of great structural works, and the growing confidence of engineers in cement as a material. The figures showed that during the last twenty years the center of the industry has shifted from Europe to the United States, and this increase of production in foreign markets had deprived European works of an important outlet for their production, the export tradė having previously been on a considerable scale. It has therefore become of urgent necessity to effect such economies in manufacture as will permit the production and sale of cement at low prices.

Old processes have been entirely remodeled, a great factor in this development being the successful application of the Rotatory process.

In addition to economies in the process of manufacture, considerable attention has also been paid to the power plant, and the cement manufacturer is increasingly in favor of the use of large gas engines or of Diesel oil-engines. The steam turbine presents a difficulty, inasmuch as the speed of rotation is inconveniently high.

The results of this modernizing of the processes of manufacture which has changed the whole technique of the industry has been to reduce the costs at works from about 18s to about 13s per ton, and there are now in operation in the United Kingdom cement works which are fully up to the best standard abroad, while the quality produced is of equal excellence.

The use of natural cement, relatively to the total consumption of hydraulic cement, is declining. In 1904 the world's output of natural cement was about 1,000,000 tons, as against 11,000,000 tons of Portland cement, whereas in 1886 the respective figures were 600,000 tons and 2,500,000 tons.

The utilization of blast furnace slag for making Portland cement was referred to, and the advantages of puzzolana as an addition to Portland cement, particularly for marine work, pointed out.

Turning to methods of controlling the quality of cement, the points of chief importance in the British Standard specification are the increased fineness required, the specification of proper chemical composition, and the insistence upon a quantitative test for soundness. In Mr. Blount's opinion, the present British Standard specification gives cement 100 per cent better than the 1886 specification, and the cement is about 30 per cent cheaper. In the specification of the future "neat tests" should be abolished, and the tests for fineness and soundness should be more rigorous than at present, while the stipulations as to chemical composition should be extended to the limits defined by modern knowledge.

The two chief methods which have been successfully employed in investigating the chemistry of cement were the synthetic and the microscopical; analytical methods have to a large extent failed.

On the important subject of cement action, Mr. Blount stated that much progress had been made towards ascertaining what took place when Portland cement was mixed with water, and that the chief results had been obtained synthetically, and by means of the microscope. It was tolerably certain that three silicates of calcium existed, and four aluminates, and recent research tended to prove that certain solid solutions of these compounds were rearranged during the act of setting. For the sake of clearness the term "alites" had been employed for the solution of tricalcic aluminate in tri-calcic silicate and "celites" were solid solutions of dicalcic aluminates in di-calcic silicates. These were the chief compounds involved in cement reaction, and much the most important matter was the hydration of the alites, which was now believed to follow somewhat on the lines of the setting of plaster of Paris.

Looking ahead, the lecturer considered that it is practically certain that the distribution of the industry will continue until every considerable center of trade has its own local supply of cement, while the consumption will increase at a rapid rate. He looked for great developments in the use of armored concrete, and concrete, either by itself or reinforced with steel, would become the most important of all structural materials. It is necessary, however, that it should be cheapened in cost, irrespective of locality.

He would direct attention to the advantage of working with the dry method, while another important point was connected with the utilization of the waste heat of the kilns, either direct under a boiler or in a producer. In the furnace of the future, the raw materials without grinding or mixing, perhaps even without drying, will be tipped in by the load, and tipped out as liquid Portland cement. There is no physical difficulty in fusing Portland cement, but to pass from the experimental to the commercial stage is a step of some magnitude. Several attempts have been made to adapt the blast furnace to this end, but, however it might be accomplished, the preparation of Portland cement by fusing the raw materials together was the task to which manufacturers should devote themselves. The advantages would be of a substantial character, if such a course were adopted, inasmuch as all need of preparation of the raw material would be abolished, and the whole routine of manufacture reduced to a state of simplicity not easy to surpass. The preparation of the raw material could be so adjusted that the fused cement would be of precisely calculated composition approaching theoretical perfection, and from the mode of manufacture, absolutely sound.

The report of the English Associated Portland Cement Manufactures (Ltd.) shows that until some time in 1906 the cement business, as in America, had been experiencing poor prices. In the current year trade improvement occurred in England as well as in this country.

The Associated Portland Cement Manufactures (Ltd.) is doing a business represented by about $1,667,500 trading profit, the earnings having been on or about the same level for the fiscal year ended June 30, 1906, and preceding year. The net operating profit for the company was about $716,000, permitting a surplus of $188,000 over a dividend on the preference shares. The liberal proportion of $100,000 earnings was devoted to reserve and depreciation, in addition to providing for ordinary renewals, depreciations, etc. The report speaks optimistically of the current year.

The White Portland Cement Co., at Kimmel, Ind., has experienced several annoying delays in getting its machinery in good running order.

CONCRETE TELEGRAPH POLES.

The Pennsylvania Railway Co. has given a contract for one mile of concrete telegraph poles to Henny Tapp of Fort Wayne, Ind. These poles will be erected near Mapes, Allen county, Indiana, on the line of the company's right of way. The poles are 30 feet high, 8-inch base and 4-inch cap. They are manufactured on the ground where they are to be erected.

The Marseilles Chamber of Commerce reports the world's production of Portland cement in 1904 as follows: United States, 3,000,000 tons; Germany, 2,500,000 tons; England, 1,500,000 tons; Belgium, 685,000 tons; France, 685,000 tons; Russia, 555,000 tons; all other countries, 500,000 tons.

So far as the production of Portland cement in the United States is concerned the statement is incorrect. The United States produced slightly over 4,189,000 tons in 1904.

The Trinity Building, twenty-one stories in height, with its 500 rooms, was ready for occupancy in a year, at a cost of $2,750,000. The St. Regis Hotel, the most magnificent hotel in the world, was completed, including nearly a year lost in strikes, decorated and equipped, in four years, at a cost of $5,000,000. The Waldorf-Astoria, with its 1,500 rooms, its magnificent decorations and its elaborate mechanical devices, cost $5,000,000.

Work on the North Western States Cement Plant at Mason City, Iowa, is progressing rapidly. The quarry is being put in shape and the structural steel framing is being pushed.

The International Cement Company of McKeesport, Pa., will shut down for the winter on account of not being able to get gas.

Memphis, Tenn., laid over one million square feet of cement walk, at an average cost of 14 cents per square foot in 1906 against 13 cents in 1905.

The American Bag Co. will erect a $125,000 reinforced concrete factory building at Memphis, Tenn., and fifty hollow concrete block dwelling houses for its employes. So far the company has been unable to secure bids from local contractors for the erection of its plant; otherwise the same would now be under way. The plant will be located at South Memphis on the Belt Line and Illinois Central Railway.

Marinette, Wis., Dec. 15.—A new company, to be called the New York Cement Company. It is announced will erect a cement plant at Rush Lake near Crivitz in this county. The project includes an electric line from Crivitz to the plant.

Baltimore, Md.—The National Concrete Construction Co. has been incorporated with capital of $25,000 by Solomon M. Kemp, 813 North Mount street; Dwight D. Mallory, 1900 Eutaw place, and William Montgomery, Jr.

The Business Men's Association of Springfield, So. Dak., has secured options on lands carrying cement material, with the view of interesting capital to embark in the manufacture of Portland cement at that point.

The Holt & Gregg Company of Anderson, Shasta county, California, are figuring on erecting a Portland cement plant on the site of the old Holt & Gregg brick plant.

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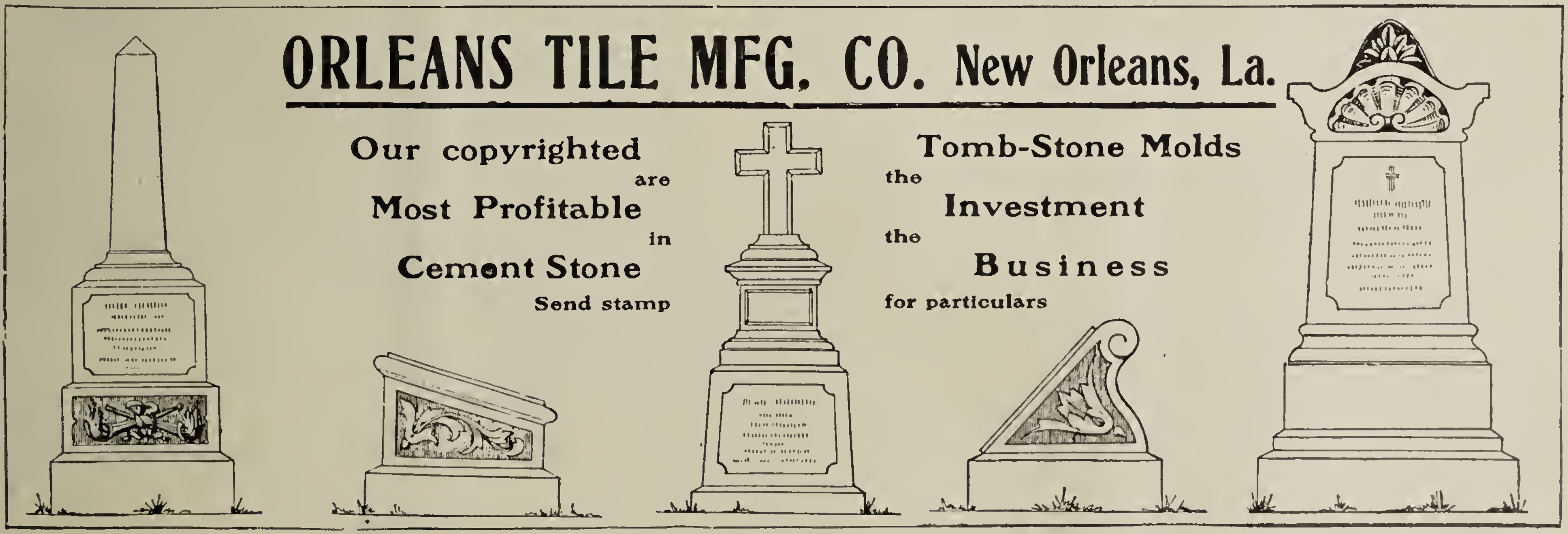
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Cement & Engineering News.

WANTED

A THOROUGHLY Competent Engineer with experience in building of cement plants will be wanted in January to assist in construction work. State experience, salary wanted, references. Address A. A., P. C. W., care of Cement and Engineering News.

POSITION wanted as Superintendent of an artificial stone or hollow block plant. Experience, 9 years in Germany and 5 years in the United States and Canada; understands every particular in that work, dry and wet process, (Stevens.) Competent to take entire charge. First-class references. Address Box C, care of CEMENT AND ENGINEERING NEWS.

WANTED

Position wanted as foreman or general foreman. Ten years' experience in construction, operating, and repair work in cement mills. Address, "Reliable" care Cement & Engineering News.

EXPERIENCED cement expert and superintendent with draftsman, electrician, general foreman, department foreman, millwrights, burners, machinists, steam engineers, also chemist and physical tester, desires change, preferably to new company. References if desired. Address Q, care Cement & Engineering News.

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An experienced and competent ornamental cement worker for inside work. Address, Zacharias Cast Stone Company, Harrisburg, Pa.

WANTED — Energetic young man with technical training (graduate) for large cement mill to assist superintendent. Address, I. C., care Cement & Engineering News.

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Position by young man with practical experience in Cement paving and general concrete work; can also estimate on work. At present manager of Company doing cement paving and manufacturing of concrete blocks. Would like to associate himself with large concern doing reinforced concrete work or general contracting. Has no preference as to locality. Address "Collins," care of Cement and Engineering News.

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University Graduate, at present in the employ of a large Western Cement Company, desires the position of chemist in a cement plant. Thoroughly experienced in the "limestone-clay" process. Address S. L. T., care of Cement and Engineering News.

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C. F. Hill of Louisville, Ky., and Urban C. Brewer and eastern capitalists have purchased 800 acres of land in Meade county, Kentucky, upon which a Portland cement plant is to be erected, having a capacity of from 1,000 to 1,500 barrels per day. Mr. Brewer is connected with the Baldwin Steel Works at Cold Springs, Putman county, N. Y., and Charleston, W. Va.

Houston, Texas—Concrete Construction.—S. S. Ashe, B. B. Jones and F. J. Sargent have incorporated the Texas Concrete Construction Co. with $5,000 capital stock.

Butter Southgate and Joseph W. Norwood, representing the Patrick Cement Co., of Stanton, Ky., came to Chicago in connection with a $250,000 bond issue of the company.

The Uncle Sam Cement Co., of Hayes City, Kan., has let the contract for its structural steel buildings to the Des Moines Steel Works of Des Moines, Ia.

A cement company is being organized at Ely, White Pine county, Nevada, by Senator Nixon, D. W. Linton and R. K. Richardson. Raw material north of Ely in the mountains will be used.

The York Portland Cement Co., of Portsmouth, O., has been organized; capital, $500,000. Dudley Hutchins will be general manager. Columbus, Ohio, capitalists are interested in the enterprise.

The Adams & Elting Paint Co., of Chicago, will erect a $100,000 reinforced concrete factory building on a five-acre tract on Sout 43d street and the Belt Line Railway.

The Iola Portland Cement Co. has secured the contract for furnishing 5,000 barrels of Portland cement at $1.60 per barrel to be used on the Garden City, Kansas, irrigation project. The price is f. o. b. Iola.

C. W. Gray, of Pocatello, Bannock county, Idaho, has organized a syndicate of Idaho and Utah capitalists to build a Portland cement plant near Pocatello.

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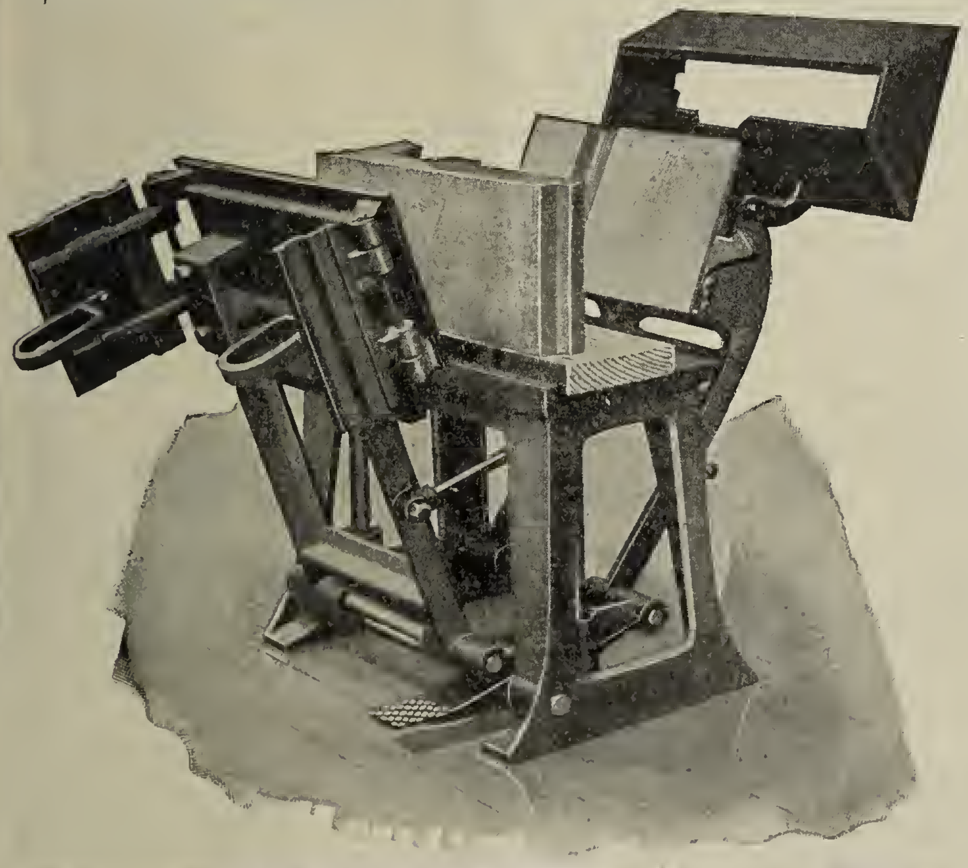

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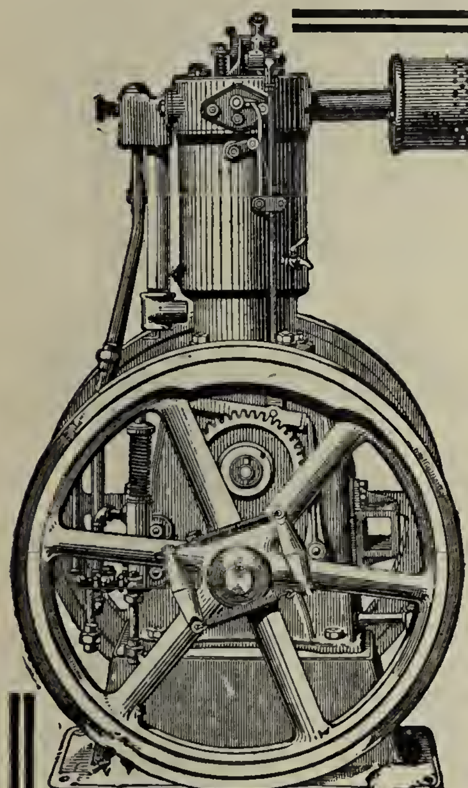

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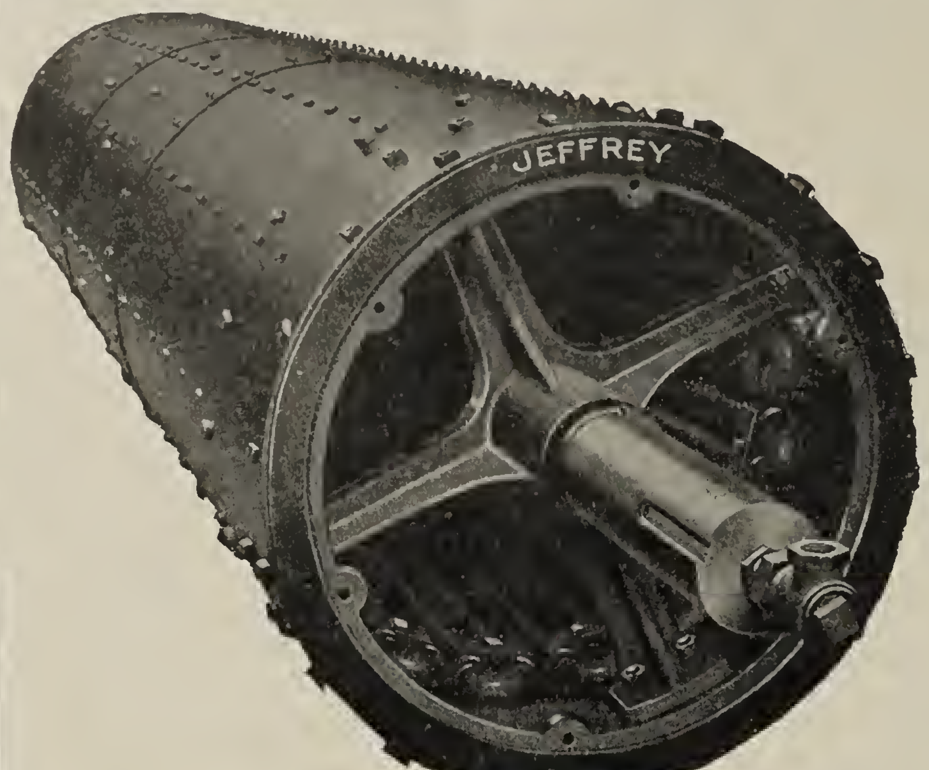

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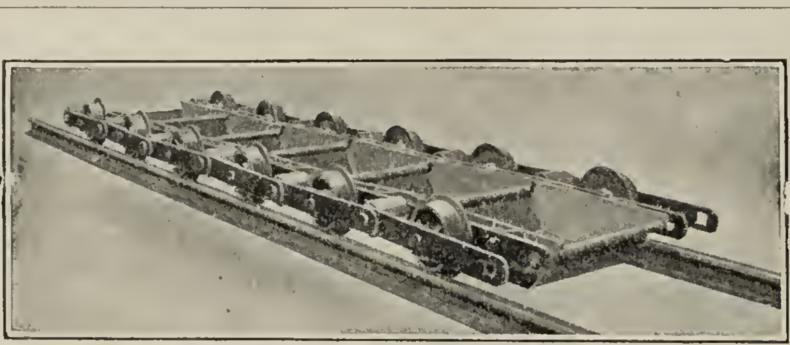

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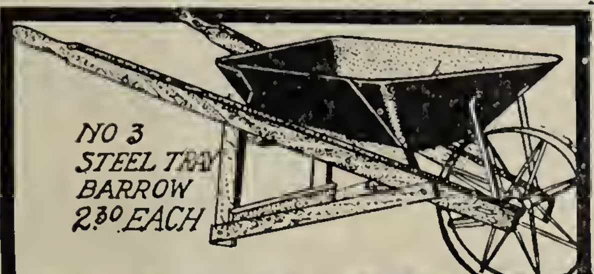

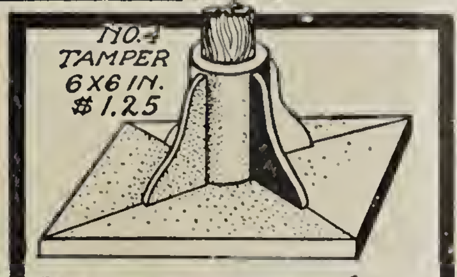

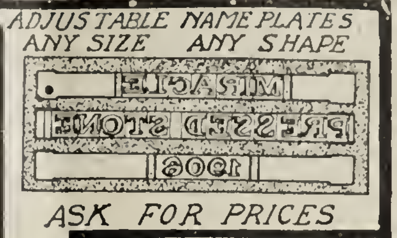

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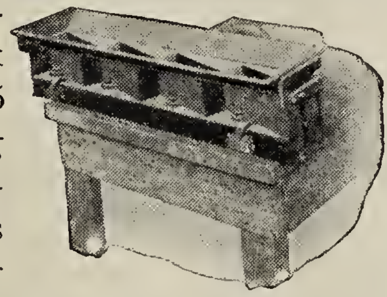

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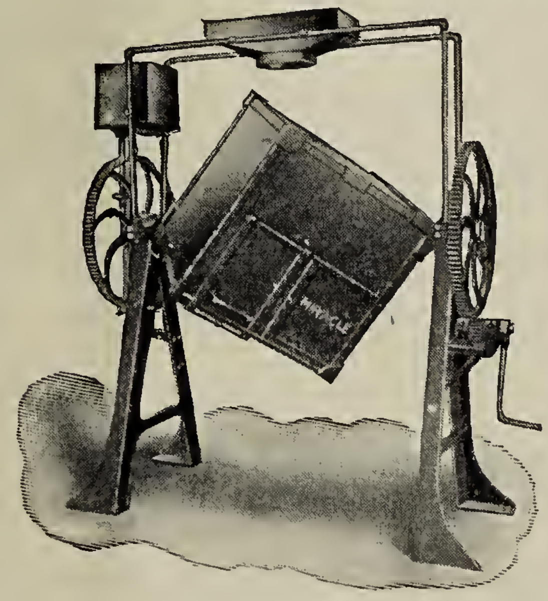
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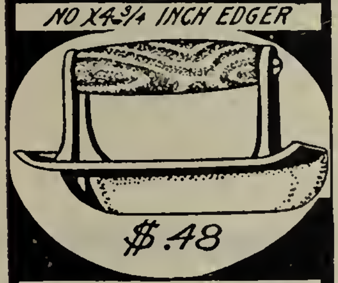

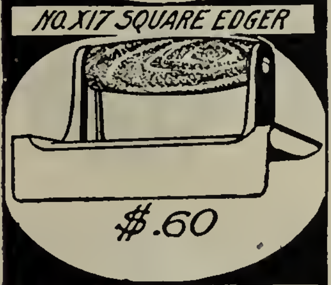

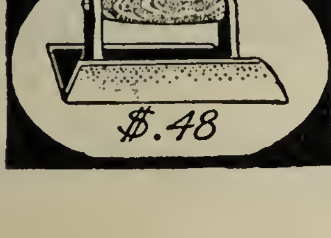

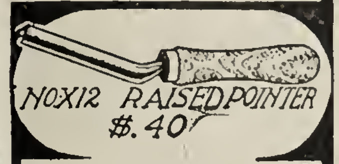

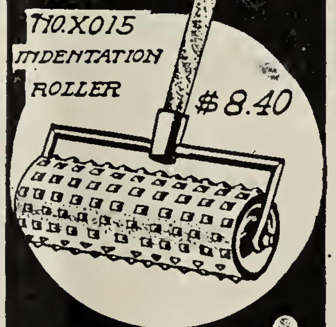

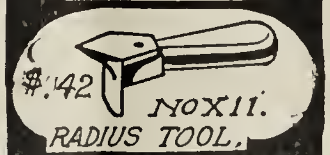
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Densitor fills the void in concrete and will stand the boiling and freezing test the same as a sound Portland Cement.

Tamped concrete can be made as dense in appearence as marble or granite and will take a polish equal to the best natural stone.

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For coating steel, used in re-inforced concrete, Densitor gives greatly increased adhesion between the cement mortar and metal.

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Snow white surfaces can be produced on concrete blocks with the Densitor material and process.

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